(19)日本国特許庁（ＪＰ）　(12) **公開特許公報（A）**　(11)特許出願公開番号

特開平10－100299

(43)公開日　平成10年(1998)４月21日

(51)Int.Cl.[6]	識別記号	ＦＩ	
Ｂ３２Ｂ　5/28		Ｂ３２Ｂ　5/28	Ｚ
5/02		5/02	Ｚ
// Ｂ６０Ｒ　13/08		Ｂ６０Ｒ　13/08	

審査請求　未請求　請求項の数８　ＯＬ　（全 ９ 頁）

(21)出願番号　特願平8－259674

(22)出願日　平成８年(1996)９月30日

(71)出願人　000001258
川崎製鉄株式会社
兵庫県神戸市中央区北本町通１丁目１番28号

(71)出願人　000006286
三菱自動車工業株式会社
東京都港区芝五丁目33番８号

(71)出願人　595030354
ケープラシート株式会社
千葉県千葉市中央区川崎町１番地

(74)代理人　弁理士　小川　順三　（外１名）

最終頁に続く

(54)【発明の名称】　成形吸音材およびその製造方法

(57)【要約】
【課題】　高い強度と剛性ならびに優れた吸音特性を兼ね備えた軽量で通気性のない成形吸音材を提供すること。
【解決手段】　熱可塑性樹脂と強化用繊維からなる主原料を抄造して得られるウエブを加熱、加圧し、こうして得られるスタンパブルシートを再加熱して膨張させたのち成形することにより、成形吸音材を製造する方法において、ウエブを加熱、加圧してシート化する際に、ウエブの一方の面に、ウエブ中に含有する熱可塑性樹脂よりもメルトフローレイトの小さい熱可塑性樹脂ａのフィルムを積層し、ウエブの他方の面には、シート化するときのウエブの加熱温度よりも融点または軟化点のいずれかが高い熱可塑性樹脂ｂのフィルムを積層することを特徴とし、こうして得られる成形吸音材は、多孔質基材の熱可塑性樹脂ａのフィルムを積層した面に、強化用繊維の含有率が多孔質基材の内層部よりも小さく空隙率の小さい含浸層が形成されていることを特徴とする。

1

【特許請求の範囲】

【請求項１】　熱可塑性樹脂と強化用繊維を主成分とする微細な空隙構造を有する多孔質基材の一方の面に、下記熱可塑性樹脂ａを含浸させることによって得られる空隙率の小さい樹脂含浸層を有し、その基材の他方の面には下記熱可塑性樹脂ｂのフィルムを積層接着してなることを特徴とする成形吸音材。

記

熱可塑性樹脂ａ；多孔質基材中の熱可塑性樹脂よりもメルトフローレイトの小さい熱可塑性樹脂

熱可塑性樹脂ｂ；スタンパブルシートのシート化および膨張成形時の材料温度よりも融点または軟化点のいずれかが高い熱可塑性樹脂

【請求項２】　熱可塑性樹脂がポリプロピレンであることを特徴とする請求項１に記載の成形吸音材。

【請求項３】　強化用繊維がグラスファイバーであることを特徴とする請求項１に記載の成形吸音材。

【請求項４】　熱可塑性樹脂ａは、そのメルトフローレイトが多孔質基材中の熱可塑性樹脂のメルトフローレイトの１／30～１／３であることを特徴とする請求項１に記載の成形吸音材。

【請求項５】　熱可塑性樹脂と強化用繊維からなる主原料を抄造して得られるウエブを加熱、加圧し、こうして得られるスタンパブルシートを再加熱して膨張させたのち成形することにより、成形吸音材料を製造する方法において、

ウエブを加熱、加圧してシート化する際に、ウエブの一方の面に、ウエブ中の熱可塑性樹脂よりもメルトフローレイトの小さい熱可塑性樹脂ａのフィルムを積層し、ウエブの他方の面には、シート化するときのウエブの加熱温度よりも融点または軟化点のいずれかが高い熱可塑性樹脂ｂのフィルムを積層することを特徴とする成形吸音材料の製造方法。

【請求項６】　ウエブ中の熱可塑性樹脂としてポリプロピレンを用いることを特徴とする請求項５に記載の製造方法。

【請求項７】　ウエブ中の強化用繊維としてグラスファイバーを用いることを特徴とする請求項５に記載の製造方法。

【請求項８】　熱可塑性樹脂ａとして、そのメルトフローレイトがウエブ中に含有する熱可塑性樹脂のメルトフローレイトの１／30～１／３である樹脂を用いることを特徴とする請求項５に記載の製造方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、自動車用天井材料などとして用いられる成形吸音材およびその製造方法に関し、とくに、高い強度と剛性ならびに優れた吸音特性を兼ね備えた成形吸音材と、この成形吸音材を有利に製造する方法についての提案である。

2

【０００２】

【従来の技術】近年の自動車は、車内の騒音を低減するために、内装材料には吸音機能を付与したものが採用されている。かかる内装材料のなかでも特に成形天井材料は車内における占有面積が広いため、この天井材料の吸音機能を向上させることは車内の騒音を低減させる上で極めて有効である。

【０００３】かかる吸音機能を有する材料としては、グラスウールやレジンフェルト等の多孔質体を熱硬化性樹脂で処理したものが知られている。しかしながら、この吸音材料は、自動車内装材料とくに天井材料として用いるには、剛性が不足する。一方で、この材料に所定の剛性を付与するには、部材としての重量が増加する、成形性に劣る、取扱い時に粉塵が発生する等の問題点があった。

【０００４】これに対して従来、上述した問題点を解消できる吸音材料として、スタンパブルシートを膨張成形したものがある。このスタンパブルシートを膨張成形してなる吸音材料は、強化用繊維とそれらを相互に点接着する熱可塑性樹脂から構成されており、微細な空隙構造を持つ一種の多孔質材料である。それ故に、この種の吸音材料は、ハンドリング中に粉塵が発生しない、形状保持力に優れる、軽量である、吸音周波数領域が広い、他の材料に比べて安価である、等の特徴がある。

【０００５】しかしながら、このような多孔質材料からなる薄い板状の吸音材料には、自動車用天井部材のような製品に用いるに当たり、吸音特性と剛性の両方の特性に優れることが必要である。

【０００６】例えば、特開平８－6549号公報に記載されているようなスタンパブルシートを膨張成形してなる吸音材料は、吸音特性の発現が背面空気層を前提としているため、厚み方向に大きな空間が必要である。そのため、この吸音材料は、狭い空間での吸音特性が要求される自動車用天井材料としては、十分な吸音特性を得ることができない、という問題点があった。仮に、所定の吸音特性を示す材料が得られたとしても、自動車用天井材料としての剛性を維持するためには、目付（単位面積当たりの重量）を極端に増加させる必要があり、軽量化できない、という欠点があった。

【０００７】また、特開平６－156161号公報には、スタンパブルシートに無機繊維層を積層することにより、吸音材料の吸音特性向上を図る技術が提案されている。しかしながら、この提案にかかる吸音材料は、無機繊維自体のコストが高いうえに、スタンパブルシート成形後に無機繊維を積層するために、製造工数が増える、材料自体が重くなる、等の欠点があった。

【０００８】一方、自動車用天井材料には、一般に、車内側の表面に装飾としての表皮材料が貼合される。この表皮材料と自動車用天井材料が共に通気性を有すると、天井自体が車内空気のフィルターの役目を担うようにな

り、表皮材料の表面が著しく汚れるという問題が生じる。かかる問題は、例えば、通気性を有する前述の特開平８－6549号公報に記載の吸音材料を自動車用天井材料として用いた場合に生じる。

【０００９】このような問題を解消するためには、例えば、表皮材料に非通気処理を施す、自動車用天井材料と表皮材料の間に非通気層を設ける、等の方法がある。しかしながら、このような非通気処理を行うと、車内騒音が非通気層で反射され、吸音材料からなる天井材料が実質的に吸音しなくなるという致命的な問題点となった。

【００１０】

【発明が解決しようとする課題】本発明は、成形吸音材に関する上述した問題点を解消するためになされたものであり、その主たる目的は、高い強度と剛性ならびに優れた吸音特性を兼ね備えた軽量で通気性のない成形吸音材を提供することにある。本発明の他の目的は、上記成形吸音材を有利に製造する方法を提案することにある。

【００１１】

【課題を解決するための手段】さて、上述したような多孔質材料の吸音は、音が多孔質材料の空隙を抜けるときに空気と材料の間に摩擦が生じ、音のエネルギーが熱エネルギーに変換されることで起こると言われている（例えば、子安著“吸音材料”技報堂参照）。

【００１２】したがって、多孔質材料の吸音特性は、材料の空隙率が極端に小さくなると、音が材料内部に入射され難くなって低下する。多孔質材料の表面に非通気層が存在する場合も低下する。また、同じ空隙率の材料で比較すると、材料の空隙構造が細かいほど、吸音層の厚みが厚いほど優れたものとなる。それ故に、吸音特性に優れた材料を得るためには、空隙率が大きく、微細な空隙構造を有する多孔質材料とする必要がある。一方、多孔質材料の強度と剛性は、空隙率が大きくなると強化用繊維同士の接着樹脂量が相対的に減少するので、必然的に低下する。

【００１３】発明者らは、このような知見に基づき、高い強度と剛性ならびに優れた吸音特性を兼ね備えた成形吸音材の開発に向け鋭意研究を行った。その結果、以下に示すような３層構造の成形吸音材とすることにより、上記の目的が実現し得ることを見出した。

①．成形吸音材の内層部を、強化用繊維の含有率を外層部よりも相対的に高くして微細な空隙構造を有する空隙率の高い層とする。これにより、この層は、膨張性と吸音特性を向上させる構造とした。この空隙率の高い層では、とくに2000Hz程度の周波数の高い音がよく吸収される。

②．上記内層部を挟む外層部の一方を、樹脂を含浸させて熱可塑性樹脂の含有率を高くすることにより、強化用繊維の含有率を内層部よりも相対的に低くして空隙率の低い緻密な層とする。これにより、この層は、剛性を向上させる構造とするとともに、通気性をもたせることで音の反射を防止して前記内層部で音を吸収させる構造とした。この緻密な層では、とくに 500～1000Hzの周波数領域の音が良く吸収される。

③．上記内層部を挟む外層部の他方を、樹脂フィルムを積層接着した通気性のない層とする。これにより、この層は、非通気性の構造とした。それ故に、このような３層構造の成形吸音材は、強度と剛性が高く、 500～2000Hzの広い周波数領域の音を良く吸収でき、かつ軽量で非通気性を有する構造となる。

【００１４】すなわち、本発明の成形吸音材は、熱可塑性樹脂と強化用繊維を主成分とする微細な空隙構造を有する多孔質基材の一方の面に、下記熱可塑性樹脂ａを含浸させることによって得られる空隙率の小さい樹脂含浸層を有し、その基材の他方の面には下記熱可塑性樹脂ｂのフィルムを積層接着してなることを特徴とする（図１参照）。

記

熱可塑性樹脂ａ；多孔質基材中の熱可塑性樹脂よりもメルトフローレイトの小さい熱可塑性樹脂

熱可塑性樹脂ｂ；スタンパブルシートのシート化および膨張成形時の材料温度よりも融点または軟化点のいずれかが高い熱可塑性樹脂

【００１５】ここで、上記本発明にかかる成形吸音材において、熱可塑性樹脂はポリプロピレンであること、強化用繊維はグラスファイバーであること、が望ましい。また、熱可塑性樹脂ａは、そのメルトフローレイトが多孔質基材中の熱可塑性樹脂のメルトフローレイトの１／30～１／３であることが望ましい。

【００１６】本発明にかかる成形吸音材の製造方法は、熱可塑性樹脂と強化用繊維からなる主原料を抄造して得られるウエブを加熱、加圧し、こうして得られるスタンパブルシートを再加熱して膨張させたのち成形することにより、成形吸音材料を製造する方法において、ウエブを加熱、加圧してシート化する際に、ウエブの一方の面に、ウエブ中の熱可塑性樹脂よりもメルトフローレイトの小さい熱可塑性樹脂ａのフィルムを積層し、ウエブの他方の面には、シート化するときのウエブの加熱温度よりも融点または軟化点のいずれかが高い熱可塑性樹脂ｂのフィルムを積層することを特徴とする。

【００１７】ここで、上記本発明にかかる成形吸音材の製造方法において、ウエブ中の熱可塑性樹脂としてはポリプロピレンを用いること、ウエブ中の強化用繊維としてはグラスファイバーを用いること、が望ましい。熱可塑性樹脂ａとしては、そのメルトフローレイトがウエブ中に含有する熱可塑性樹脂のメルトフローレイトの１／30～１／３である樹脂を用いることが望ましい。

【００１８】

【発明の実施の形態】以下に、この発明にかかる成形吸音材とその製造方法を構成する各成分（または要素）について説明する。

熱可塑性樹脂について

ウエブに用いられる熱可塑性樹脂としては、ポリエチレンやポリプロピレンなどのポリオレフィン、ポリスチレン、ポリ塩化ビニル、ポリエチレンテレフタレート、ポリカーボネート、ポリアミド、ポリアセタールなどの樹脂、ならびにこれらの樹脂を主成分とする共重合体（例えば、エチレン－塩化ビニル共重合体、エチレン－酢酸ビニル共重合体等）やグラフト化合物、もしくはこれらの樹脂のブレンド品などが挙げられる。なかでも、強度と価格面から好ましいのは、ポリプロピレンであるが、この発明に関して、不適合な熱可塑性樹脂は特にない。

【００１９】この熱可塑性樹脂は、それのメルトフローレートが10～300g／10分であることが好ましい。この理由は、メルトフローレートが10 g／10分より小さいと接着性が悪くなり、一方、300g／10分より大きいと樹脂自体の強度が低くなり、結局、いずれの場合も吸音材自体の強度が低くなるからである。

【００２０】この熱可塑性樹脂は、強化用繊維との接着性を向上させるために、酸やエポキシなどの種々の化合物で変性させたものを併用できる。特に、ポリプロピレンの場合には、マレイン酸や無水マレイン酸、アクリル酸などで変性したものが好適であり、その変性基は、酸無水物基、カルボキシル基、水酸基等が好ましい。なお、その他の変性基でも、この発明に関して不適合なものはない。このような変性樹脂を熱可塑性樹脂と併用する場合には、それぞれの樹脂粒子を用いてウエブを製造しても良いし、これらの樹脂を予め押し出し機などで溶融混練したペレットや、このペレットを粉砕したものを使用してもよい。また、一方の樹脂を他の樹脂でコーティングしたものを用いることもできる。

【００２１】なお、ウエブに用いられる上記熱可塑性樹脂の形状は、特に限定されず、粒子状の他、例えば繊維状やフレーク状の熱可塑性樹脂が用いられる。特に粒子状の場合には、その粒径が50～2000μmの範囲内にあるものを用いることが望ましい。この理由は、粒径が2000μmを超えると、強化用繊維に樹脂が均一に分散したスタンパブルシートを得ることが難しく、一方、粒径が50μm未満では、ウエブからの樹脂の脱落が多くなるからである。

【００２２】また、上記熱可塑性樹脂は、耐候性や耐熱性を向上させるための添加剤を予め添加することができる。この場合にも、変性樹脂の場合と同様に、それぞれの粒子を用いてウエブを製造しても良いし、これらの粒子を予め押し出し機などで溶融混練し、粉砕した物を使用しても良い。また、一方の粒子を他の材料でコーティングしたものを用いることもできる。

【００２３】強化用繊維について

ウエブに用いられる強化用繊維としては、グラスファイバー、ロックファイバー、炭素繊維、金属繊維の他に、各種有機繊維、無機繊維を用いることができる。

【００２４】この強化用繊維の繊維長は、得られる成形吸音材が十分な剛性を有し、かつ抄造成形時の成形性を確保するという点から、５～30㎜、好ましくは10～26㎜の範囲内とすることが望ましい。この理由は、繊維長が５㎜より短いと、十分な剛性が得られず、一方、繊維長が30㎜を超えると、抄造工程で強化用繊維が十分に開繊せず、成形体の膨張性が低下すると共にその膨張が不均一になり、成形時の賦形性も悪化するからである。なお、膨張性と強度のバランスから異なる繊維長の繊維を混合することも有効である。

【００２５】この強化用繊維の繊維径は、吸音特性と繊維による補強効果および膨張効果を確保するという点から、７～25μm、好ましくは11～23μmの範囲内とすることが望ましい。この理由は、繊維径が５μmより小さいと、十分な膨張倍率が得られず、一方、繊維径が30μmを超えると、十分な吸音特性と剛性が得られないからである。なお、異なる繊維径の繊維を混合すると、吸音特性と繊維による補強効果および膨張効果を向上させる上で有効である。

【００２６】この強化用繊維は、必要によりカップリング剤あるいは収束剤による処理が施される。とくに、強化用繊維がグラスファイバーの場合には、バインダー成分である熱可塑性樹脂との濡れ性や接着性を改良するために、シランカップリング剤による処理が施される。このシランカップリング剤としては、ビニルシラン系、アミノシラン系、エポキシシラン系、メタクリルシラン系、クロロシラン系、メルカプトシラン系のカップリング剤を用いることが好ましい。このようなシランカップリング剤によるグラスファイバーの処理は、グラスファイバーを攪拌混合しながらシランカップリング剤溶液を噴霧する方法や、カップリング剤溶液中にグラスファイバーを浸漬する方法などの既知の方法によって行うことができる。

【００２７】また、成形吸音材の剛性と膨張性を向上させるために、強化用繊維は単繊維に開繊させることが望ましい。そのため、上記強化用繊維は、水溶性の収束剤による処理が施される。この収束剤としては、ポリエチレンオキシド系やポリビニルアルコール系などがある。

【００２８】強化用繊維と熱可塑性樹脂の配合率について

抄造後のウエブ（乾燥後）中に占める強化用繊維の配合率（含有量）は、用いる強化用繊維と熱可塑性樹脂の比重や他の原料の添加によっても異なるが、強化用繊維としてグラスファイバーを用い熱可塑性樹脂としてポリプロピレンを用いた場合、強化用繊維の配合率は、乾燥ウエブの総重量に対して50～80wt％となるようにすることが望ましい。この理由は、強化用繊維の配合率が50wt％より少ないと、十分な剛性が期待できず、吸音性も不十分であり、しかも膨張性が悪いために空隙率の高い多孔質成形品が得られない。一方、強化用繊維の配合率が80

wt％を超えると、抄造後のウエブが脆くなってハンドリング性が悪くなる他、膨張させた場合には、バインダー成分としての熱可塑性樹脂が不足して、樹脂を強化用繊維接合点に均一に含浸することが難しくなり、得られる成形吸音材の剛性の低下を招くからである。

【００２９】熱可塑性樹脂ａについて

熱可塑性樹脂ａは、多孔質基材中あるいはウエブ中に含有する熱可塑性樹脂よりもメルトフローレイトの小さい熱可塑性樹脂である。この熱可塑性樹脂ａは、ウエブをシート化する際に、多孔質基材の一方の面に含浸され、その多孔質基材の表層部は、内層部よりも相対的に強化用繊維量が少なくなって空隙率の小さい樹脂含浸層を形成する。その結果、この樹脂含浸層の部分は、スプリングバック量が小さく、十分に膨張しなくなる。このため、熱可塑性樹脂ａが含浸された多孔質基材の表層部は、空隙の少ない構造となり、成形吸音材全体として剛性が向上する。一方、多孔質基材の上記樹脂含浸層以外の部分（成形吸音材の内層部）は、樹脂含浸層部に比べて強化用繊維の含有率が高いので、そのスプリングバック量は大きく、十分に膨張する。このため、多孔質基材の上記樹脂含浸層以外の部分では、所期した吸音特性を発揮し得る。所期した吸音特性を発揮し得るには、前記樹脂含浸層以外の部分の比重を 0.3未満とすることが望ましい。このように、多孔質基材の一方の面に、熱可塑性樹脂ａを含浸させることによって得られる空隙率の小さい樹脂含浸層を有する構造とすることにより、得られる成形吸音材は、優れた吸音特性を維持しつつ、剛性に優れたものとなる。

【００３０】ここで重要なことは、熱可塑性樹脂ａを含浸させた成形吸音材の一方の外層部が、必ず通気性を有することである。これは、吸音特性を維持させるために不可欠だからである。当該外層部が通気性を有するためには、熱可塑性樹脂ａのメルトフローレイトが重要であり、本発明では、この熱可塑性樹脂ａとして、多孔質基材中あるいはウエブ中に含有する熱可塑性樹脂よりもメルトフローレイトの小さい熱可塑性樹脂を採用するのである。この熱可塑性樹脂ａは、より好ましくは、その樹脂のメルトフローレイト（以下、単に「ＭＦＲ」という。）が多孔質基材中あるいはウエブ中に含有される熱可塑性樹脂のＭＦＲの１／30～１／３であることが望ましい。この理由は、前記ＭＦＲの比が１／３より大きいと、シート化する際に、樹脂がウエブの内層部にまで含浸してしまい、後に行う膨張成形において膨張不足となるとともに、得られる成形吸音材の耐荷重性が向上しない。一方、前記ＭＦＲの比が１／30より小さいと、ウエブ中への樹脂の含浸が困難となり、後に行う膨張成形において熱可塑性樹脂ａの層が表層に完全に残留し、得られる成形吸音材には通気の全くない樹脂層が形成される結果、騒音がこの層で反射され、吸音特性が著しく低下するからである。このように、熱可塑性樹脂ａが多孔質基材の内層部にまで含浸せずにその表層部に残留し、通気のある状態になって、はじめて十分な吸音特性が得られるのである。

【００３１】この熱可塑性樹脂ａを含浸させる際に用いるフィルムの厚みは、要求される剛性や吸音率によって異なるが、通常30～300 μｍとすることが望ましい。この理由は、このフィルムの厚みが30μｍ未満では、吸音材の強度が十分に向上せず、一方、300 μｍを超えると、膨張性と通気性が悪くなるからである。また、この熱可塑性樹脂ａとしては、例えば、ポリエチレンやポリプロピレンなどのポリオレフィン、ポリスチレン、ポリ塩化ビニル、ポリエチレンテレフタレート、ポリカーボネート、ポリアミド、ポリアセタールなどの樹脂、ならびにこれらの樹脂を主成分とする共重合体（例えば、エチレン－塩化ビニル共重合体、エチレン－酢酸ビニル共重合体等）やグラフト化合物、もしくはこれらの樹脂のブレンド品などが挙げられる。

【００３２】熱可塑性樹脂ｂについて

熱可塑性樹脂ｂは、シート化するときのウエブの加熱温度よりも融点または軟化点のいずれかが高い熱可塑性樹脂である。この熱可塑性樹脂ｂは、上記条件を満足する樹脂であれば、特に限定されず、例えば、ポリプロピレンなどのポリオレフィン、ポリスチレン、ポリ塩化ビニル、ポリエチレンテレフタレート、ポリカーボネート、ポリアミド、ポリアセタールなどの樹脂、ならびにこれらの樹脂を主成分とする共重合体（例えば、エチレン－塩化ビニル共重合体、エチレン－酢酸ビニル共重合体等）やグラフト化合物、もしくはこれらの樹脂のブレンド品などが挙げられる。ここで、このような熱可塑性樹脂ｂのフィルムを多孔質基材あるいはウエブの他方の面に積層接着する理由は、車内騒音に対して優れた吸音特性を維持しつつ、自動車用天井材料に非通気性を付与するためであり、熱可塑性樹脂ｂの融点または軟化点のいずれかがシート化するときのウエブの加熱温度よりも低いと、シート化あるいは膨張成形の時に熱可塑性樹脂ｂの溶融粘度が低くなり、フィルム表面に亀裂が入り易く、非通気性を確保できないからである。

【００３３】この熱可塑性樹脂ｂのフィルムの厚みは、要求される剛性や通気性によって異なるが、通常10～100 μｍ、より好ましくは15～60μｍとすることが望ましい。この理由は、このフィルムの厚みが10μｍ未満では、膨張成形時にフィルムが破れ易く、一方、 100μｍを超えると、吸音材が重くなり経済的にも不利だからである。また、当該フィルムと多孔質基材中あるいはウエブ中に含有する熱可塑性樹脂との接着性が良くない場合には、当該フィルムに接着性樹脂（接着層）を１層以上積層し、多層フィルム化してウエブに積層接着することができる。

【００３４】なお、本発明にかかる上記成形吸音材には、上述した各種成分の他に、酸化防止剤、耐光安定

剤、金属不活性化剤、難燃剤、カーボンブラックなどの添加剤や着色剤等を含有させることができる。これらの添加剤や着色剤は、例えば、粒状の熱可塑性樹脂に予め配合やコーティングしたり、ウエブにスプレーなどで添加することにより製品に含有させることができる。

【００３５】次に、本発明にかかる成形吸音材を製造する方法について説明する。

(1) ウエブの作製（抄造法）

界面活性剤を含有する水溶液を予め泡立てた泡液中に、強化用繊維と熱可塑性樹脂を主成分とする原料を分散させる。次いで、得られた分散液を多孔性支持体上で吸引、脱泡することにより、分散液中の固形分を堆積させ、その堆積物を乾燥させることで不織布状の中間生成物が得られる。この不織布状の中間生成物をウエブと称する。このウエブの厚さは、通常１～30㎜である。

【００３６】ここで、使用できる界面活性剤としては、アニオン、ノニオン、カチオン系の何れでも良い。特に、ドデシルベンゼルスルホン酸ナトリウム、やし油脂肪酸ジエタノールアミド等は、強化用繊維と熱可塑性樹脂を主成分とする原料を均一に分散させることに優れている点で有利に用いられる。

【００３７】なお、泡を用いた抄造方法で製造したウエブは、幅方向および厚み方向の原料の分散が均一で、かつ強化用繊維がほとんど単繊維の状態にまで開繊している。

【００３８】(2) スタンパブルシートの作製

上記(1) の抄造工程で作製したウエブを、強化用繊維と熱可塑性樹脂とが十分に含浸するように加熱、加圧し、次いで加圧下で冷却固化することにより、緻密なシート（スタンパブルシート）を作製する。

【００３９】特に本発明では、このシート化工程で、ウエブの一方の面に、ウエブ中に含有する熱可塑性樹脂よりもメルトフローレイトの小さい熱可塑性樹脂ａのフィルムを積層し、ウエブの他方の面に、シート化するときのウエブの加熱温度よりも融点または軟化点のいずれかが高い熱可塑性樹脂ｂのフィルムを積層し、シート化する点に特徴がある。これにより、熱可塑性樹脂ａのフィルムを積層したウエブの外層側は、熱可塑性樹脂ａが含浸して空隙が少なくかつ通気性を有する構造となり、この外層側を除くウエブ部分は、微細な空隙構造を有する空隙率の高い構造となり、熱可塑性樹脂ｂのフィルムを積層接着した部分は、通気性のない構造となる、３層構造の成形吸音材を得ることができる。

【００４０】ここで、シート化するときのウエブの予熱温度は、ウエブ中の熱可塑性樹脂の融点以上かつ分解温度未満とすることが望ましい。特に、熱可塑性樹脂がポリプロピレンの場合には、前記予熱温度は 170～230 ℃、好ましくは 190～220 ℃とすることが望ましい。この理由は、 230℃を超えると、ポリプロピレンの熱分解や劣化による着色や強度低下を招くからである。

【００４１】また、シート化するときのウエブの加圧力は、強化用繊維中に十分に熱可塑性樹脂を含浸させるためには、 0.5～50kgf/㎠ の範囲内とするのが望ましい。この理由は、加圧力が 0.5 kgf/㎠ より小さいと、含浸が不十分となって所期の剛性が得られない。一方、加圧力が50kgf/㎠ を超えると、強化用繊維の破損を生じて所期の剛性および膨張性が得られないからである。

【００４２】なお、ウエブをシート化する方法としては、通常のバッチ式の間欠プレス法、テフロンやスチールベルトを用いた連続プレス法など、公知のあらゆる方法を適用することができる。

【００４３】このようにして得られたスタンパブルシートは、強化用繊維が単繊維に開繊した状態で積み重なっている。このため、再び熱可塑性樹脂を溶融させると、元のウエブの状態に戻ろうとする強化用繊維の剛性により、ほぼウエブの厚さにまで厚みが回復する。この現象は、抄造法で作製したスタンパブルシート特有のものであり、スプリングバックと称する。このスプリングバックを起こす原動力は強化用繊維の剛性であるので、このスプリングバックの大きさは強化用繊維の量や特性に依存する。

【００４４】(3) 成形吸音材料の製造（膨張成形）

上記(2) で作製したスタンパブルシートを、再び熱可塑性樹脂を溶融させて、強化用繊維の上記スプリングバック力により膨張させ、金型内に供給して、空隙率がゼロの時の比重よりも小さくなるように圧縮、冷却固化すること（これを膨張成形と称する）により、本発明にかかる成形吸音材を製造する。

【００４５】ここで、スタンパブルシートを膨張させる際の加熱温度は、熱可塑性樹脂の融点以上かつ分解温度未満とすることが望ましい。特に、熱可塑性樹脂がポリプロピレンの場合には、前記加熱温度は 170～230 ℃、好ましくは 190～220 ℃とすることが望ましい。この理由は、 230℃を超えると、ポリプロピレンの分解による着色や強度低下を招くからである。また、上記膨張シートを圧縮成形する際の金型温度、あるいは冷却固化する温度は、熱可塑性樹脂の凝固点以下であればよく、ハンドリング性や生産性の点から、通常、60℃以下とする。さらに、膨張成形圧力は、製品形状により異なるが、通常、50kgf/㎠ 以下とする。この理由は、過剰の圧力は強化用繊維を破断させるからである。

【００４６】なお、本発明にかかる上記成形吸音材の製造方法では、ウエブに熱と圧力をかけて強化用繊維中に熱可塑性樹脂を含浸させる工程（スタンパブルシートの作製工程）で、熱可塑性樹脂ａ，ｂのフィルム以外のフィルムやシート、不織布等を同時に貼合したり、他材料との複合化を行い、意匠性やその他の機能を付与することができる。

【００４７】

【実施例】以下に、本発明を実施例に基づいて具体的に

説明する。

（実施例１）本実施例で用いた強化用繊維と熱可塑性樹脂は次のとおりである。

・熱可塑性樹脂：ポリプロピレン粒子（ＭＦＲ；20、平均粒径； 500μｍ、融点； 160℃）

・強化用繊維：グラスファイバー（長さ；25㎜、直径；13μｍ）（アミノシラン系カップリング剤とポリエチレンオキシド系収束剤で処理したもの）

(1) 界面活性剤を含有する水溶液を予め泡立てた泡液中に、それぞれ乾燥重量％で、ポリプロピレン粒子30％およびグラスファイバー70％からなる成分組成の原料を混合し、総目付960 g/㎡となるように、脱泡、乾燥してウエブを作製した。

(2) 前記(1) で作製したウエブの表面に、熱可塑性樹脂ａのフィルムとしてポリプロピレンフィルム（ 200μｍ厚み、ＭＦＲ＝２）を、裏面に、熱可塑性樹脂ｂのフィルムとしてナイロン６フィルム（融点 233℃、25μｍ厚み）とポリプロピレンフィルム（融点 160℃、40μｍ厚み、ＭＦＲ＝８）の２層フィルムを、それぞれ積層した。このとき、熱可塑性樹脂ｂのフィルムは、ポリプロピレンフィルムをウエブ側にして積層した。

(3) 前記(2) で得られた積層体を、210 ℃に加熱し、３kgf/㎠ の圧力で加圧し、加熱および加圧された積層体を25℃の冷却盤間に配置し、３kgf/㎠ の圧力でプレスして固化し、緻密なスタンパブルシートを作製した。

(4) 前記(3) で作製したスタンパブルシートを、遠赤外線ヒーターで210 ℃に加熱し、クリアランスを 4.2㎜に設定した平板の金型により圧縮、冷却し、良好な板状の成形吸音材を製造した。このときの成形吸音材の厚みは 4.0㎜であった。

【００４８】このようにして得られた成形吸音材について、その断面を顕微鏡で観察した結果、成形品の内部と比較して表面付近に強化用繊維の含有率の低い、空隙率の低い樹脂含浸層が存在することが分かった。また、得られた成形吸音材の通気性を調べたところ、熱可塑性樹脂ａのフィルムを積層して含浸させた面は通気性があったが、熱可塑性樹脂ｂのフィルムを貼合した面は通気性がなかった。

【００４９】（実施例２）ウエブの裏面に、熱可塑性樹脂ｂのフィルムとしてポリエチレンテレフタレートフィルム（融点 256℃、25μｍ厚み）とポリプロピレンフィルム（融点 168℃、40μｍ厚み、ＭＦＲ＝８）の２層フィルムを積層したこと以外は、実施例１と同様にして、厚み 4.0㎜の成形吸音材を製造した。

【００５０】このようにして得られた成形吸音材について、その断面を顕微鏡で観察した結果、成形品の内部と比較して表面付近に強化用繊維の含有率の低い、空隙率の低い樹脂含浸層が存在することが分かった。また、得られた成形吸音材の通気性を調べたところ、熱可塑性樹脂ａのフィルムを積層して含浸させた面は通気性があったが、熱可塑性樹脂ｂのフィルムを貼合した面は通気性がなかった。

【００５１】（比較例１）

(1) 泡液中に、それぞれ乾燥重量％で、ポリプロピレン粒子30％およびグラスファイバー70％からなる成分組成の原料を混合し、総目付1140g/㎡となるように脱泡、乾燥してウエブを作製した。

(2) 前記(1) で作製したウエブの裏面に、熱可塑性樹脂ｂのフィルムとしてナイロン６フィルム（融点 233℃、25μｍ厚み）のみを積層した。

(3) 前記(2) で得られた積層体を、210 ℃に加熱し、３kgf/㎠ の圧力で加圧し、加熱および加圧された積層体を25℃の冷却盤間に配置し、３kgf/㎠ の圧力でプレスして固化し、緻密なスタンパブルシートを作製した。

(4) 前記(3) で作製したスタンパブルシートを、遠赤外線ヒーターで210 ℃に加熱し、クリアランスを 4.2㎜に設定した平板の金型により圧縮、冷却し、厚みが4.0㎜の板状の成形吸音材を製造した。

【００５２】このようにして得られた成形吸音材について、その断面を顕微鏡で観察した結果、熱可塑性樹脂ｂのフィルムを積層した面は空隙のない層であったが、他の部分は均一な空隙を有する構造になっていることが分かった。また、得られた成形吸音材の通気性を調べたところ、フィルムを積層しなかった面は通気性があったが、熱可塑性樹脂ｂのフィルムを積層した面は通気性がなかった。

【００５３】（比較例２）ウエブの両面に、フィルムを積層せずにスタンパブルシートを作製したこと以外は、比較例１と同様にして、厚み 4.0㎜の成形吸音材を製造した。

【００５４】このようにして得られた成形吸音材について、その断面を顕微鏡で観察した結果、均一な空隙を有する構造になっていることが分かった。また、得られた成形吸音材の通気性を調べたところ、両面とも通気性があった。

【００５５】以上説明したようにして製造した実施例１，２と比較例１，２の成形吸音材から、50㎜幅×120ｍｍ 長さの試験片を切り出し、この試験片について、熱可塑性樹脂ａのフィルムを貼合した面（比較例については、フィルムを貼合していない面）からポンチを押す曲げ試験（クロスヘッドスピード50㎜／min 、スパン間距離100㎜）を行った。このときの弾性勾配は、スパン間距離 100㎜のときの荷重(kgf) とたわみ量(㎜)の傾きである。また、JIS A 1405に準じた垂直入射吸音率の測定を行った。垂直入射吸音率が1.0 のとき、音は完全に吸音される。その結果、曲げ特性の結果を表１に、吸音率測定の結果を図２に示す。

【００５６】

【表１】

	最大荷重（kgf/50㎜）	弾性勾配（kgf/cm/50㎜）
実施例１	５．３１	８．３３
実施例２	５．２９	８．４３
比較例１	１．８８	４．４３
比較例２	１．８６	４．３２

【００５７】この表１および図２に示す結果から明らかなように、本発明のような構造にすれば、成形吸音材は、最大荷重および弾性勾配が高くなり、優れた強度特性を示すと共に、500 ～2000Hzの広い周波数領域での吸音特性が優れたものとなることがわかった。

【００５８】

【発明の効果】以上説明したように本発明によれば、高い強度と剛性ならびに優れた吸音特性を兼ね備えた軽量で通気性のない成形吸音材を提供することができる。これにより、本発明にかかる成形吸音材は、剛性を必要とする吸音材料、例えば自動車用天井材料やエンジンルーム、ダッシュパネルなどとして有効に使用できる。

＊【図面の簡単な説明】

【図１】この発明にかかる成形吸音材の構造を示す部分断面概略図である。

【図２】垂直入射吸音率と周波数の関係を示す図である。

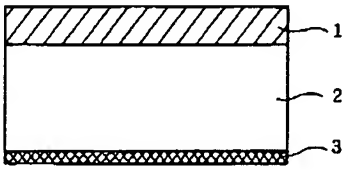
【符号の説明】

１　熱可塑性樹脂ａが多孔質基材に含浸されてなる樹脂含浸層

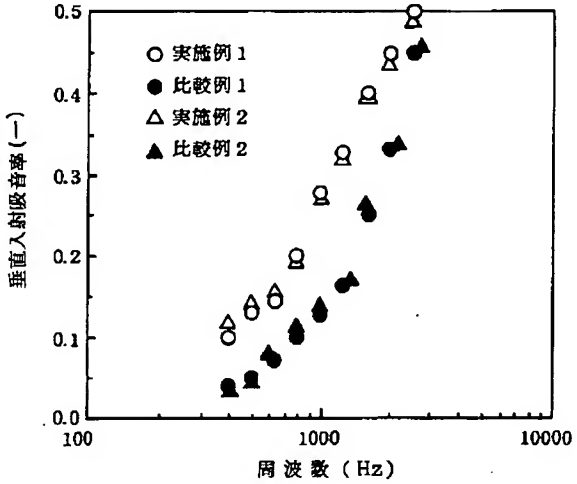
２　熱可塑性樹脂と強化用繊維を主成分とする多孔質基材の層

３　熱可塑性樹脂ｂの層

【図１】



【図２】



フロントページの続き

(72)発明者　藤巻　雅美
千葉県千葉市中央区川崎町１番地　川崎製鉄株式会社技術研究所内
(72)発明者　長山　勝博
千葉県千葉市中央区川崎町１番地　川崎製鉄株式会社技術研究所内
(72)発明者　高野　茂
千葉県千葉市中央区川崎町１番地　川崎製鉄株式会社技術研究所内
(72)発明者　永島　之夫
千葉県千葉市中央区川崎町１番地　川崎製鉄株式会社技術研究所内

(72)発明者　吉武　裕幸
東京都千代田区内幸町２丁目２番３号　川崎製鉄株式会社内
(72)発明者　山村　陽茂
東京都港区芝５丁目33番８号　三菱自動車工業株式会社内
(72)発明者　宇留治　泰
東京都港区芝５丁目33番８号　三菱自動車工業株式会社内
(72)発明者　東郷　詳
東京都港区芝５丁目33番８号　三菱自動車工業株式会社内
(72)発明者　荒木　豊
千葉県千葉市中央区川崎町１番地　ケープラシート株式会社内

[Claim(s)]
[Claim 1] Shaping acoustic material characterized by having a resin sinking-in layer with the small voidage obtained by infiltrating the following thermoplastics a into one [which has the detailed opening structure which uses thermoplastics and the fiber for strengthening as a principal component] field of a porosity base material, and coming to carry out laminating adhesion of the film of the following thermoplastics b in the field of another side of the base material.
Thermoplastics thermoplastics b with a melt flow rate smaller than the thermoplastics in an account thermoplastics a; porosity base material; thermoplastics with either the melting point or softening temperature higher than sheet-izing of a stumpable sheet, and the material temperature at the time of expansion molding
[claim 2] Shaping acoustic material according to claim 1 characterized by thermoplastics being polypropylene.
[Claim 3] Shaping acoustic material according to claim 1 characterized by the fiber for strengthening being glass fiber.
[Claim 4] Thermoplastics a is a shaping acoustic material according to claim 1 characterized by the melt flow rate being 1 / 30 - 1/3 in a porosity base material of a melt flow rate. [of thermoplastics]
[Claim 5] By heating the web milled and obtained, pressurizing the main raw material which consists of thermoplastics and fiber for strengthening, and fabricating, after reheating the stumpable sheet obtained in this way and expanding it In case it sets to the approach of manufacturing shaping sound absorption material, and a web is heated and pressurized and is sheet-ized The laminating of the film of thermoplastics a with a melt flow rate smaller than the thermoplastics in a web is carried out to one field of a web. In the field of another side of a web The manufacture approach of the shaping sound absorbing material characterized by carrying out the laminating of the film of thermoplastics b with either the melting point or softening temperature higher than whenever [stoving temperature / of the web when sheet-izing].
[Claim 6] The manufacture approach according to claim 5 characterized by using polypropylene as thermoplastics in a web.
[Claim 7] The manufacture approach according to claim 5 characterized by using glass fiber as fiber for strengthening in a web.
[Claim 8] The manufacture approach according to claim 5 characterized by using the resin which is 1 / 30 - 1/3 of a melt flow rate which the melt flow rate contains in a web as thermoplastics a. [of thermoplastics]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention is a proposal about an approach which manufactures advantageously the shaping acoustic material which has high reinforcement, rigidity, and outstanding sound absorption characteristics especially,

and this shaping acoustic material about the shaping acoustic material used as a head-lining ingredient for automobiles etc., and its manufacture approach.

[0002]

[Description of the Prior Art] In order that an automobile in recent years may reduce the noise in the car, what gave the absorption-of-sound function is adopted as interior materials. Since especially a shaping head-lining ingredient has a large occupancy area in in the car also in these interior materials, it is very effective to raise the absorption-of-sound function of this head-lining ingredient, when reducing the noise in the car.

[0003] As an ingredient which has this absorption-of-sound function, what processed porous bodies, such as glass wool and resin felt, with thermosetting resin is known. However, this sound absorbing material runs short of rigidity, in order to use as automobile interior materials, especially a head-lining ingredient. On the other hand, in order to have given predetermined rigidity to this ingredient, there was a trouble of that it is inferior to a moldability, dust being generated at the time of handling which the weight as a member increases.

[0004] On the other hand, there are some which carried out expansion molding of the stumpable sheet as sound absorption material which can cancel conventionally the trouble mentioned above. The sound absorbing material which comes to carry out expansion molding of this stumpable sheet consists of thermoplastics which carries out adhesion arrival of the fiber for strengthening, and them mutually, and is a kind of porous material with detailed opening structure. So, this kind of sound absorbing material has the cheap description of ** compared with other ingredients with the large lightweight absorption-of-sound frequency domain which dust does not generate and which is excellent in configuration holding power during handling.

[0005] However, in using for a product like the head-lining member for automobiles, it is required for the thin tabular sound absorbing material which consists of such a porous material to excel in sound absorption characteristics and the property of rigid both.

[0006] For example, since the manifestation of sound absorption characteristics is premised on the tooth-back air space for the sound absorbing material which comes to carry out expansion molding of the stumpable sheet which is indicated by JP,8-6549,A, it needs big space for the thickness direction. Therefore, this sound absorbing material had the trouble that sufficient sound absorption characteristics could not be obtained as a head-lining ingredient for automobiles with which the sound absorption characteristics in narrow space are demanded. Even if the ingredient in which predetermined sound absorption characteristics are shown is obtained, in order to maintain the rigidity as a head-lining ingredient for automobiles, there was a fault that it was necessary to make it increase extremely, and-izing of the eyes (weight per unit area) could not be carried out [lightweight].

[0007] Moreover, the technique of aiming at improvement in sound absorption characteristics of a sound absorbing material is proposed by JP,6-156161,A by carrying out the laminating of the inorganic fiber layer to a stumpable sheet. However, the sound absorption material concerning this proposal had a fault, like that a manufacture man day increases and the ingredient itself becomes heavy in the top

where the cost of the inorganic fiber itself is high, in order to carry out the laminating of the inorganic fiber after a stampable sheet moulding.

[0008] On the other hand, generally the epidermis ingredient as an ornament is pasted together on the front face by the side of in the car by the head-lining ingredient for automobiles. If both this epidermis ingredient and the head-lining ingredient for automobiles have permeability, the head lining itself will come to bear the duty of the filter of air in the car, and the problem that the front face of an epidermis ingredient becomes dirty remarkably will arise. This problem is produced when the sound absorbing material of a publication is used for above-mentioned JP,8-6549,A which has permeability as a head-lining ingredient for automobiles.

[0009] In order to solve such a problem, there are approaches, such as preparing a non-aeration layer between the head-lining ingredient for automobiles which performs non-aeration processing to for example, an epidermis ingredient, and an epidermis ingredient. However, when such non-aeration processing was performed, the noise in the car was reflected in the non-aeration layer, and the head-lining ingredient which consists of a sound absorbing material became a fatal trouble of stopping absorbing sound substantially.

[0010]

[Problem(s) to be Solved by the Invention] This invention is made in order to cancel the trouble about shaping acoustic material mentioned above, and the main purpose is in offering the shaping [which has high reinforcement, rigidity, and outstanding sound absorption characteristics] acoustic material which is lightweight and does not have permeability. Other purposes of this invention are to propose the approach of manufacturing the above-mentioned shaping acoustic material advantageously.

[0011]

[Means for Solving the Problem] Now, when a sound escapes from the opening of a porous material, friction makes absorption of sound of a porous material which was mentioned above between air and an ingredient, and it is said that it happens by the energy of a sound being transformed into heat energy (for example, refer to "sound absorbing material" Gihodo Shuppan Co., Ltd. written by Koyasu).

[0012] Therefore, if the voidage of an ingredient becomes extremely small, that incidence is hard to be carried out to the interior of an ingredient, it will become and, as for the sound absorption characteristics of a porous material, a sound will fall. It falls, also when a non-aeration layer exists on the surface of a porous material. Moreover, it becomes what was excellent, so that the thickness of an absorption-of-sound layer was so thick that the opening structure of an ingredient was fine when the ingredient of the same voidage compared. So, in order to obtain the ingredient excellent in sound absorption characteristics, voidage is large and it is necessary to consider as the porous material which has detailed opening structure. On the other hand, since the amount of adhesion resin of the fiber for strengthening will decrease relatively if voidage becomes large, the reinforcement of a porous material and rigidity fall inevitably.

[0013] Artificers inquired wholeheartedly towards development of the shaping acoustic material which has high reinforcement, rigidity, and outstanding sound absorption characteristics based on such knowledge. Consequently, it found out that

the above-mentioned purpose could be realized by considering as the shaping acoustic material of a three-tiered structure as shown below.

** . It considers as a layer with the high voidage which makes content of the fiber for strengthening relatively higher than the outer layer section for the inner layer section of shaping acoustic material, and has detailed opening structure. Thereby, this layer was made into the structure which raises expansibility and sound absorption characteristics. In a layer with this high voidage, a sound especially with the high frequency of about 2000Hz is absorbed well.

** . By one side of the outer layer section which sandwiches the above-mentioned inner layer section infiltrating resin, and making content of thermoplastics high, rather than the inner layer section, make content of the fiber for strengthening low relatively, and let it be a precise layer with low voidage. Thereby, this layer was made into the structure of preventing reflection of a sound by giving permeability and making a sound absorbing in said inner layer section while making it into the structure which raises rigidity. It is in this precise layer. The sound of a 500-1000Hz frequency domain is absorbed well.

** . Let another side of the outer layer section which sandwiches the above-mentioned inner layer section be a layer without the permeability which carried out laminating adhesion of the resin film. Thereby, this layer was made into the structure of non-permeability. so, such a shaping acoustic material of a three-tiered structure has reinforcement and high rigidity -- the sound of the large frequency domain which is 500-2000Hz is well absorbable, and it is lightweight and becomes the structure of having non-permeability.

[0014] That is, it is characterized by the shaping acoustic material of this invention having a resin sinking-in layer with the small voidage obtained by infiltrating the following thermoplastics a into one [which has the detailed opening structure which uses thermoplastics and the fiber for strengthening as a principal component] field of a porosity base material, and coming to carry out laminating adhesion of the film of the following thermoplastics b in the field of another side of the base material (refer to drawing 1).

Thermoplastics thermoplastics b with a melt flow rate smaller than the thermoplastics in an account thermoplastics a; porosity base material; thermoplastics with either the melting point or softening temperature higher than sheet-izing of a stumpable sheet, and the material temperature at the time of expansion molding

[0015] Here, in the shaping acoustic material concerning above-mentioned this invention, thermoplastics's being polypropylene and the fiber for strengthening have desirable being [it / glass fiber] **. Moreover, as for Thermoplastics a, it is desirable for the melt flow rate to be 1 / 30 - 1/3 in a porosity base material of a melt flow rate. [of thermoplastics]

[0016] By the manufacture approach of the shaping acoustic material concerning this invention heating the web milled and obtained, and pressurizing the main raw material which consists of thermoplastics and fiber for strengthening, and fabricating, after reheating the stumpable sheet obtained in this way and expanding it In case it sets to the approach of manufacturing shaping sound absorption material, and a web is heated and pressurized and is sheet-ized The laminating of the film of

thermoplastics a with a melt flow rate smaller than the thermoplastics in a web is carried out to one field of a web. In the field of another side of a web It is characterized by carrying out the laminating of the film of thermoplastics b with either the melting point or softening temperature higher than whenever [stoving temperature / of the web when sheet-izing].

[0017] Here, using polypropylene as thermoplastics in a web in the manufacture approach of the shaping acoustic material concerning above-mentioned this invention and using-as fiber for strengthening in web-glass fiber ** are desirable. It is desirable to use the resin which is 1 / 30 - 1/3 of a melt flow rate which the melt flow rate contains in a web as thermoplastics a. [of thermoplastics]

[0018]

[Embodiment of the Invention] Below, each component (or element) which constitutes the shaping acoustic material concerning this invention and its manufacture approach is explained.

As thermoplastics used for a web about thermoplastics, the copolymers (for example, an ethylene-vinyl chloride copolymer, an ethylene-vinylacetate copolymer, etc.) which use resin, such as polyolefines, such as polyethylene and polypropylene, polystyrene, a polyvinyl chloride, polyethylene terephthalate, a polycarbonate, a polyamide, and polyacetal, and these resin as a principal component, a graft compound or the blend article of these resin, etc. is mentioned. Although polypropylene is desirable from reinforcement and a price side especially, there is especially no incongruent thermoplastics about this invention.

[0019] As for this thermoplastics, it is desirable that the melt flow rates of that are 10-300g / 10 minutes. If this reason has a melt flow rate smaller than 10 g / 10 minutes, an adhesive property will worsen, and on the other hand, if larger than 300g / 10 minutes, the reinforcement of resin itself will become low, and in any case, the reinforcement of the acoustic material itself is because it becomes low after all.

[0020] This thermoplastics can use together what was denatured with various compounds, such as an acid and epoxy, in order to raise an adhesive property with the fiber for strengthening. In the case of polypropylene, what denaturalized with the maleic acid, a maleic anhydride, an acrylic acid, etc. is suitable especially, and the denaturation radical has an acid-anhydride radical, a carboxyl group, a desirable hydroxyl group, etc. In addition, an incongruent thing does not have other denaturation radicals about this invention, either. When using such modified resin together with thermoplastics, a web may be manufactured using each resin particle and the pellet which carried out melting kneading of these resin with the extruder etc. beforehand, and the thing which ground this pellet may be used. Moreover, what coated one resin with other resin can also be used.

[0021] In addition, especially the configuration of the above-mentioned thermoplastics used for a web is not limited, but the thermoplastics of the shape of a flake, fibrous [shape / of a particle / others, for example, fibrous,], is used. It is desirable to use especially the thing in within the limits the particle size of whose is 50-2000 micrometers in the case of-like [particle]. When particle size exceeds 2000 micrometers, it is difficult for this reason for the fiber for strengthening to obtain the stumpable sheet which resin distributed to homogeneity, and on the other hand, particle size is because omission of the resin from a web increase in less than 50 micrometers.

[0022] Moreover, the above-mentioned thermoplastics can add the additive for raising weatherability and thermal resistance beforehand. Also in this case, like the case of modified resin, a web may be manufactured using each particle, melting kneading of these particles may be beforehand carried out with an extruder etc., and the ground object may be used. Moreover, what coated one particle with other ingredients can also be used.

[0023] As fiber for strengthening used for a web about the fiber for strengthening, the various organic fiber and the inorganic fiber other than glass fiber, a lock fiber, a carbon fiber, and a metal fiber can be used.

[0024] As for the fiber length of this fiber for strengthening, it is desirable for within the limits of 10-26mm to cost 5-30mm preferably from the point of having rigidity with a sufficient shaping acoustic material obtained, and securing the moldability at the time of paper-milling shaping. This reason is that sufficient rigidity will not be acquired if fiber length is shorter than 5mm, but that expansion becomes an ununiformity on the other hand while the fiber for strengthening will not fully open at a paper-milling process but the expansibility of a Plastic solid will fall, if fiber length exceeds 30mm, and the formativeness at the time of shaping also gets worse. In addition, it is also effective to mix the fiber of fiber length which is different from the balance of expansibility and reinforcement.

[0025] As for the diameter of fiber of this fiber for strengthening, it is desirable to make 7-25 micrometers into within the limits of 11-23 micrometers preferably from the point of securing the reinforcement effectiveness and the expansion effectiveness by sound absorption characteristics and fiber. This reason is that sufficient expansion scale factor will not be obtained if the diameter of fiber is smaller than 5 micrometers, and sufficient sound absorption characteristics and rigidity will not be acquired on the other hand if the diameter of fiber exceeds 30 micrometers. In addition, if the fiber of a different diameter of fiber is mixed, it is effective when raising the reinforcement effectiveness and the expansion effectiveness by sound absorption characteristics and fiber.

[0026] As for this fiber for strengthening, processing by the coupling agent or the convergence agent is performed as occasion demands. When the fiber for strengthening is glass fiber, in order to improve especially the wettability and the adhesive property with thermoplastics which are a binder component, processing by the silane coupling agent is performed. As this silane coupling agent, it is desirable to use the coupling agent of a vinylsilane system, an amino silane system, an epoxy silane system, an methacrylic silane system, a chlorosilicane system, and a mercapto silane system. Processing of the glass fiber by such silane coupling agent can be performed by known approaches, such as the approach of spraying a silane coupling agent solution, while carrying out stirring mixing of the glass fiber, and an approach immersed in glass fiber into a coupling agent solution.

[0027] Moreover, in order to raise the rigidity of shaping acoustic material, and expansibility, as for the fiber for strengthening, it is desirable to carry out filamentation to a single fiber. Therefore, processing according [the above-mentioned fiber for strengthening] to a water-soluble convergence agent is performed. As this convergence agent, there are a polyethylene oxide system, a polyvinyl alcohol system, etc.

[0028] Although the rate of combination (content) of the fiber for strengthening and the fiber for strengthening occupied in the web after paper milling (after desiccation) about the rate of combination of thermoplastics changes also with addition of the specific gravity of the fiber for strengthening and thermoplastics to be used, or other raw materials When polypropylene is used

as thermoplastics, using glass fiber as fiber for strengthening, as for the rate of combination of the fiber for strengthening, it is desirable to make it become 50 - 80wt% to the AUW of a desiccation web. If this reason has few rates of combination of the fiber for strengthening than 50wt(s)%, sufficient rigidity is not expectable, and absorption-of-sound nature is also inadequate, and since expansibility is bad, moreover, porosity mold goods with high voidage will not be obtained. It is because the fall of the rigidity of the shaping acoustic material which it becomes difficult for the thermoplastics as a binder component to be insufficient when the web after paper milling will become weak on the other hand if the rate of combination of the fiber for strengthening exceeds 80wt(s)%, handling nature worsens and also it is made to expand, and to sink resin into the fiber join for strengthening at homogeneity, and is obtained is caused.

[0029] It is thermoplastics with a melt flow rate smaller than the thermoplastics which contains Thermoplastics a in a porosity base material or a web about Thermoplastics a. In case this thermoplastics a sheet-izes a web, it sinks into one field of a porosity base material, and the amount for strengthening of the surface section of that porosity base material of fiber becomes less than the inner layer section relatively, and it forms a resin sinking-in layer with small voidage. Consequently, the part of this resin sinking-in layer will have the small amount of springbacks, and will not fully expand. For this reason, the surface section of the porosity base material with which Thermoplastics a sank in serves as structure with few openings, and its rigidity improves as the whole shaping acoustic material. On the other hand, since the content of the fiber for strengthening is high compared with a resin sinking-in layer, parts other than the above-mentioned resin sinking-in layer of a porosity base material of the amount of springbacks (inner layer section of shaping acoustic material) are large, and fully expand. For this reason, in parts other than the above-mentioned resin sinking-in layer of a porosity base material, the sound absorption characteristics which carried out expected can be demonstrated. In order to be able to demonstrate the sound absorption characteristics which carried out expected, it is the specific gravity of parts other than said resin sinking-in layer. Carrying out to less than 0.3 is desirable. Thus, the shaping acoustic material obtained by considering as the structure of having a resin sinking-in layer with the small voidage obtained by infiltrating Thermoplastics a into one field of a porosity base material becomes the thing excellent in rigidity, maintaining outstanding sound absorption characteristics.

[0030] An important thing is that one [into which Thermoplastics a was infiltrated] outer layer section of shaping acoustic material surely has permeability here. This is because it is indispensable in order to maintain sound absorption characteristics. In order for the outer layer section concerned to have permeability, the melt flow rate of Thermoplastics a is important, and adopts thermoplastics with a melt flow rate smaller than the thermoplastics contained in a porosity base material or a web as this thermoplastics a in this invention. As for this thermoplastics a, it is desirable more preferably that it is 1 / 30 - 1/3 of MFR which the melt flow rate (only henceforth "MFR") of that resin contains in a porosity base material or a web. [of thermoplastics] If the ratio of said MFR is larger than one third, in case it will sheet-ize, resin sinks even into the inner layer section of a web, and its load carrying capacity of the shaping acoustic material obtained does not improve while it becomes insufficient expanding this reason in the expansion molding performed behind. It is because the noise is reflected in this layer on the other hand as a result of forming the resin layer the layer of Thermoplastics a does not have [layer] aeration in the shaping acoustic material which remains completely on a surface and is obtained in the expansion molding which sinking [of the resin to the inside of a web] in becomes

difficult, and is performed behind when the ratio of said MFR is smaller than 1/30, and sound absorption characteristics fall remarkably. Thus, sufficient sound absorption characteristics are obtained only after Thermoplastics a remains in the surface section, without sinking even into the inner layer section of a porosity base material and is in the condition that aeration occurs.

[0031] The thickness of the film used in case this thermoplastics a is infiltrated is usually 30-300, although it changes with the rigidity and the acoustic absorptivities which are demanded. Being referred to as mum is desirable. For this reason, in less than 30 micrometers, the reinforcement of acoustic material does not fully improve, but, on the other hand, the thickness of this film is 300. It is because expansibility and permeability will worsen if mum is exceeded. Moreover, as this thermoplastics a, the copolymers (for example, an ethylene-vinyl chloride copolymer, an ethylene-vinylacetate copolymer, etc.) which use resin, such as polyolefines, such as polyethylene and polypropylene, polystyrene, a polyvinyl chloride, polyethylene terephthalate, a polycarbonate, a polyamide, and polyacetal, and these resin as a principal component, a graft compound or the blend article of these resin, etc. is mentioned, for example.

[0032] It is thermoplastics with either the melting point or softening temperature higher than whenever [stoving temperature / of the web when sheet-izing Thermoplastics b] about Thermoplastics b. If this thermoplastics b is resin with which are satisfied of the above-mentioned conditions, the copolymers (for example, an ethylene-vinyl chloride copolymer, an ethylene-vinylacetate copolymer, etc.) which are not limited especially, for example, use resin, such as polyolefines, such as polypropylene, polystyrene, a polyvinyl chloride, polyethylene terephthalate, a polycarbonate, a polyamide, and polyacetal, and these resin as a principal component, a graft compound or the blend article of these resin, etc. will be mentioned. The reason for carrying out laminating adhesion the film of such thermoplastics b to the field of another side of a porosity base material or a web here If it is for giving non-permeability to the head-lining ingredient for automobiles and is lower than whenever [stoving temperature / of a web in case either the melting point of Thermoplastics b or softening temperature sheet-izes], maintaining the sound absorption characteristics which were excellent to the noise in the car It is because the melt viscosity of Thermoplastics b becomes low at the time of sheet-izing or expansion molding, a crack tends to go into a film front face and non-permeability cannot be secured.

[0033] The thickness of the film of this thermoplastics b is usually 10-100, although it changes with the rigidity and the permeability which are demanded. It is desirable mum and to be more preferably referred to as 15-60 micrometers. This reason is acoustic material becomes heavy and also economically disadvantageous [acoustic material], if a film tends to be torn at the time of expansion molding and the thickness of this film exceeds 100 micrometer on the other hand in less than 10 micrometers. Moreover, when an adhesive property with the thermoplastics contained in a film and a porosity base material concerned, or a web is not good, on the film concerned, the one or more layer laminating of the adhesive resin (glue line) can be carried out, it can be multilayer-film-ized, and laminating adhesion can be carried out at a web.

[0034] In addition, the above-mentioned shaping acoustic material concerning this invention can be made to contain additives, coloring agents, etc., such as an anti-oxidant, light stabilizer-proof, a metal deactivator, a flame retarder, and carbon black, other than the various components mentioned above. A product can be made to contain these additives and coloring agents by blended and coating beforehand or adding by a spray etc. to the thermoplastics of the shape for example, of a grain, at a web.

[0035] Next, how to manufacture the shaping acoustic material concerning this invention is

explained.
(1) Production of a web (the milling-paper method)
foam the water solution containing a surfactant beforehand -- the raw material which uses the fiber for strengthening and thermoplastics as a principal component is distributed in ******. Subsequently, the solid content in dispersion liquid is made to deposit the obtained dispersion liquid suction and by carrying out degassing on a porous base material, and a nonwoven fabric-like intermediate product is acquired by drying the deposit. The intermediate product of the shape of this nonwoven fabric is called a web. The thickness of this web is usually 1-30mm.
[0036] Here, as a surface active agent which can be used, any of an anion, Nonion, and a cation system are sufficient. It is advantageously used at a point excellent in making homogeneity distribute the raw material with which dodecyl BENZERU sulfonic-acid sodium, coconut oil fatty-acid diethanolamide, etc. especially use the fiber for strengthening, and thermoplastics as a principal component.
[0037] In addition, the web manufactured by the paper-milling approach using a bubble has uniform distribution of the raw material of the cross direction and the thickness direction, and the fiber for strengthening has almost opened it even in the condition of a single fiber.
[0038] (2) The production above of a stumpable sheet (1) A precise sheet (stumpable sheet) is produced by heating, pressurizing the web produced at the paper-milling process so that the fiber for strengthening and thermoplastics may fully sink in, and subsequently carrying out cooling solidification under pressurization.
[0039] The laminating of the film of thermoplastics a with a melt flow rate smaller than the thermoplastics contained [especially] in a web in one field of a web to a sheet chemically-modified [this] degree by this invention is carried out, the laminating of the film of thermoplastics b with either the melting point or softening temperature higher than whenever [stoving temperature / of the web when sheet-izing to the field of another side of a web] is carried out, and the description is that it sheet-izes. The part which Thermoplastics a sank in, the opening became the structure of having permeability few, by this in the outer layer side of the web which carried out the laminating of the film of Thermoplastics a, and the web part except this outer layer side became the structure of having detailed opening structure and that voidage was high, and carried out laminating adhesion of the film of Thermoplastics b can obtain the shaping acoustic material of a three-tiered structure used as structure without permeability.
[0040] Here, as for the preheat temperature of the web when sheet-izing, it is desirable to carry out to more than the melting point of the thermoplastics in a web and under decomposition temperature. the case where thermoplastics is polypropylene especially -- said preheat temperature 170-230 ** -- desirable -- Considering as 190-220 ** is desirable. It is because the coloring and the fall on the strength by the pyrolysis or degradation of polypropylene will be caused if this reason and 230 degree C are exceeded.
[0041] Moreover, the welding pressure of the web when sheet-izing is 0.5 - 50 kgf/cm2, in order to fully infiltrate thermoplastics into the fiber for strengthening. Considering as within the limits is desirable. Welding pressure this reason If smaller than 0.5 kgf/cm2, it will become inadequate sinking in and expected rigidity will not be acquired. On the other hand, welding pressure is 50 kgf/cm2. It is because breakage of the fiber for strengthening will be produced and expected rigidity and expansibility will not be acquired, if it exceeds.
[0042] In addition, all well-known approaches, such as the continuation pressing method using the intermittent pressing method of the usual batch type, Teflon, and a steel band belt as an

approach of sheet-izing a web, are applicable.

[0043] Thus, the obtained stumpable sheets are piled up after the fiber for strengthening has opened to the single fiber. For this reason, if melting of the thermoplastics is carried out again, thickness will be mostly recovered even in the thickness of a web with the rigidity of the fiber for strengthening which is going to return to the condition of the original web. This phenomenon is peculiar to the stumpable sheet produced by the milling-paper method, and is called springback. Since the motive power which causes this springback is the rigidity of the fiber for strengthening, it depends for the magnitude of this springback on the amount and property of the fiber for strengthening.

[0044] (3) Manufacture of a shaping sound absorbing material (expansion molding)

Above (2) The shaping acoustic material concerning this invention is manufactured by carrying out melting of the thermoplastics again, expanding the produced stumpable sheet according to the above-mentioned springback force of the fiber for strengthening, supplying in metal mold, and compressing and carrying out cooling solidification so that it may become smaller than specific gravity in case voidage is zero (this being called expansion molding).

[0045] Here, as for whenever [stoving temperature / at the time of expanding a stumpable sheet], it is desirable to carry out to more than the melting point of thermoplastics and under decomposition temperature. the case where thermoplastics is polypropylene especially -- whenever [said stoving temperature] 170-230 ** -- desirable -- Considering as 190-220 ** is desirable. It is because the coloring and the fall on the strength by disassembly of polypropylene will be caused if this reason and 230 degree C are exceeded. Moreover, the die temperature at the time of pressing the above-mentioned expansion sheet or temperature which carries out cooling solidification is usually made into 60 degrees C or less from the point of handling nature or productivity that what is necessary is just below the congealing point of thermoplastics. Furthermore, an expansion molding pressure is usually 50 kgf/cm2, although it changes with product configurations. It considers as the following. It is because the pressure with this superfluous reason makes the fiber for strengthening fracture.

[0046] In addition, by the manufacture approach of the above-mentioned shaping acoustic material concerning this invention, at the process (making process of a stumpable sheet) which heat and a pressure are put [process] on a web and infiltrates thermoplastics into the fiber for strengthening, the films and sheets other than the film of Thermoplastics a and b, a nonwoven fabric, etc. can be pasted together to coincidence, or compound-ization with other ingredients can be performed, and the function of design nature or others can be given.

[0047]

[Example] Below, this invention is concretely explained based on an example.

(Example 1) The fiber for strengthening and thermoplastics which were used by this example are as follows.

- Thermoplastics : polypropylene particle (MFR;20, mean-particle-diameter; 500micrometer, the melting point; 160 degrees C)
- Fiber for strengthening : glass fiber (die length; 25mm, diameter;13micrometer) (what was processed by the amino silane system coupling agent and the polyethylene oxide system convergence agent)

(1) foam the water solution containing a surfactant beforehand -- into ******, by dry weight %, the raw material of the component presentation which consists of 30% [of polypropylene particles] and glass fiber 70% is mixed, and it becomes total eyes 960 g/m2, respectively -- as -- degassing --

it dried and the web was produced.
(2) Above (1) The polypropylene film (200micrometer thickness, MFR=2) was carried out as a film of Thermoplastics a, and the laminating of the two-layer film of a nylon 6 film (melting point 233 degrees C, 25-micrometer thickness) and a polypropylene film (melting point 160 degrees C, 40-micrometer thickness, MFR=8) was carried out to the front face of the produced web as a film of Thermoplastics b at the rear face, respectively. At this time, the film of Thermoplastics b carried out and carried out the laminating of the polypropylene film to the web side.
(3) Above (2) The obtained layered product is heated to 210 **, and it is 3 kgf/cm2. The layered product which pressurized by the pressure, and was heated and pressurized is arranged between the 25-degree C cooling boards, and it is 3 kgf/cm2. It pressed and solidified by the pressure and the precise stumpable sheet was produced.
(4) Above (3) The produced stumpable sheet is heated to 210 ** at a far-infrared heater, and it is path clearance. It compressed and cooled with the monotonous metal mold set as 4.2mm, and a good tabular shaping acoustic material was manufactured. Thickness of the shaping acoustic material at this time It was 4.0mm.
[0048] Thus, about the obtained shaping acoustic material, as a result of observing the cross section under a microscope, it turned out that a resin sinking-in layer with low voidage with the low content of the fiber for strengthening exists near a front face as compared with the interior of mold goods. Moreover, although the field into which the laminating of the film of Thermoplastics a was carried out, and it was infiltrated had permeability when the permeability of the obtained shaping acoustic material was investigated, the field which pasted the film of Thermoplastics b together did not have permeability.
[0049] (Example 2) It is thickness like an example 1 except having carried out the laminating of the two-layer film of a polyethylene terephthalate film (melting point 256 degrees C, 25-micrometer thickness) and a polypropylene film (melting point 168 degrees C, 40-micrometer thickness, MFR=8) to the rear face of a web as a film of Thermoplastics b. 4.0mm shaping acoustic material was manufactured.
[0050] Thus, about the obtained shaping acoustic material, as a result of observing the cross section under a microscope, it turned out that a resin sinking-in layer with low voidage with the low content of the fiber for strengthening exists near a front face as compared with the interior of mold goods. Moreover, although the field into which the laminating of the film of Thermoplastics a was carried out, and it was infiltrated had permeability when the permeability of the obtained shaping acoustic material was investigated, the field which pasted the film of Thermoplastics b together did not have permeability.
[0051] (Example 1 of a comparison)
(1) into foam liquid, by dry weight %, the raw material of the component presentation which consists of 30% [of polypropylene particles] and glass fiber 70% is mixed, and it is set to the 1140g of the total eyes/, and m2, respectively -- as -- degassing -- it dried and the web was produced.
(2) Above (1) The laminating only of the nylon 6 film (melting point 233 degrees C, 25-micrometer thickness) was carried out to the rear face of the produced web as a film of Thermoplastics b.
(3) Above (2) The obtained layered product is heated to 210 **, and it is 3 kgf/cm2. The layered product which pressurized by the pressure, and was heated and pressurized is arranged between the 25-degree C cooling boards, and it is 3 kgf/cm2. It pressed and solidified by the pressure and the precise stumpable sheet was produced.

(4) Above (3) The produced stumpable sheet is heated to 210 ** at a far-infrared heater, and it is path clearance. It compressed and cooled with the monotonous metal mold set as 4.2mm, and a tabular shaping acoustic material whose thickness is 4.0mm was manufactured.

[0052] Thus, although it was a layer without an opening, as for the field which carried out the laminating of the film of Thermoplastics b as a result of observing the cross section under a microscope about the obtained shaping acoustic material, it turned out that other parts have the structure of having a uniform opening. Moreover, although the field which did not carry out the laminating of the film had permeability when the permeability of the obtained shaping acoustic material was investigated, the field which carried out the laminating of the film of Thermoplastics b did not have permeability.

[0053] (Example 2 of a comparison) It is thickness like the example 1 of a comparison except having produced the stumpable sheet, without carrying out the laminating of the film to both sides of a web. 4.0mm shaping acoustic material was manufactured.

[0054] Thus, about the obtained shaping acoustic material, as a result of observing the cross section under a microscope, it turned out that it has the structure of having a uniform opening. Moreover, when the permeability of the obtained shaping acoustic material was investigated, both sides had permeability.

[0055] The shaping acoustic material of examples 1 and 2 and the examples 1 and 2 of a comparison to 50mm width-of-face x120mm manufactured as explained above The test piece of die length was cut down and the bending test (crosshead speed 50 mm/min, distance between spans of 100mm) which pushes punch from the field (field which is not pasting the film together about the example of a comparison) which pasted the film of Thermoplastics a together about this test piece was performed. The elastic inclination at this time is the distance between spans. Load at the time of 100mm (kgf) It bends and is the inclination of an amount (mm). Moreover, the normal incidence sound absorption coefficient according to JIS A 1405 was measured. A normal incidence sound absorption coefficient is 1.0. Solving, a sound absorbs sound completely. Consequently, the result of the acoustic-absorptivity measurement of the result of a bending property to Table 1 is shown in drawing 2 .

[0056]

[Table 1]

	最大荷重 (kgf/50mm)	弾性勾配 (kgf/cm/50mm)
実施例1	5．31	8．33
実施例2	5．29	8．43
比較例1	1．88	4．43
比較例2	1．86	4．32

[0057] When making it structure like this invention so that clearly from the result shown in this Table 1 and drawing 2 , it turned out that shaping acoustic material becomes the thing excellent in the sound absorption characteristics in a 500-2000Hz large frequency domain while maximum

load and elastic inclination become high and it shows the outstanding strength property.
[0058]
[Effect of the Invention] As explained above, according to this invention, the shaping [which has high reinforcement rigidity, and outstanding sound absorption characteristics] acoustic material which is lightweight and does not have permeability can be offered. Thereby, the shaping acoustic material concerning this invention can be effectively used as the sound absorption material which needs rigidity, for example, the head-lining ingredient for automobiles, an engine room, a dash panel, etc.

TECHNICAL FIELD

[Field of the Invention] This invention is a proposal about an approach which manufactures advantageously the shaping acoustic material which has high reinforcement, rigidity, and outstanding sound absorption characteristics especially, and this shaping acoustic material about the shaping acoustic material used as a head-lining ingredient for automobiles etc., and its manufacture approach.

PRIOR ART

[Description of the Prior Art] In order that an automobile in recent years may reduce the noise in the car, what gave the absorption-of-sound function is adopted as interior materials. Since especially a shaping head-lining ingredient has a large occupancy area in in the car also in these interior materials, it is very effective to raise the absorption-of-sound function of this head-lining ingredient, when reducing the noise in the car.
[0003] As an ingredient which has this absorption-of-sound function, what processed porous bodies, such as glass wool and resin felt, with thermosetting resin is known. However, this sound absorbing material runs short of rigidity, in order to use as automobile interior materials, especially a head-lining ingredient. On the other hand, in order to have given predetermined rigidity to this ingredient, there was a trouble of that it is inferior to a moldability, dust being generated at the time of handling which the weight as a member increases.
[0004] On the other hand, there are some which carried out expansion molding of the stumpable sheet as sound absorption material which can cancel conventionally the trouble mentioned above. The sound absorbing material which comes to carry out expansion molding of this stumpable sheet consists of thermoplastics which carries out adhesion arrival of the fiber for strengthening, and them mutually, and is a kind of porous material with detailed opening structure. So, this kind of sound absorbing material has the cheap description of ** compared with other ingredients with the large lightweight absorption-of-sound frequency domain which dust does not generate and which is excellent in configuration holding power during handling.
[0005] However, in using for a product like the head-lining member for automobiles, it is required for the thin tabular sound absorbing material which consists of such a porous material to excel in sound absorption characteristics and the property of rigid both.

[0006] For example, since the manifestation of sound absorption characteristics is premised on the tooth-back air space for the sound absorbing material which comes to carry out expansion molding of the stumpable sheet which is indicated by JP,8-6549,A, it needs big space for the thickness direction. Therefore, this sound absorbing material had the trouble that sufficient sound absorption characteristics could not be obtained as a head-lining ingredient for automobiles with which the sound absorption characteristics in narrow space are demanded. Even if the ingredient in which predetermined sound absorption characteristics are shown is obtained, in order to maintain the rigidity as a head-lining ingredient for automobiles, there was a fault that it was necessary to make it increase extremely, and-izing of the eyes (weight per unit area) could not be carried out [lightweight].

[0007] Moreover, the technique of aiming at improvement in sound absorption characteristics of a sound absorbing material is proposed by JP,6-156161,A by carrying out the laminating of the inorganic fiber layer to a stumpable sheet. However, the sound absorption material concerning this proposal had a fault, like that a manufacture man day increases and the ingredient itself becomes heavy in the top where the cost of the inorganic fiber itself is high, in order to carry out the laminating of the inorganic fiber after a stampable sheet moulding.

[0008] On the other hand, generally the epidermis ingredient as an ornament is pasted together on the front face by the side of in the car by the head-lining ingredient for automobiles. If both this epidermis ingredient and the head-lining ingredient for automobiles have permeability, the head lining itself will come to bear the duty of the filter of air in the car, and the problem that the front face of an epidermis ingredient becomes dirty remarkably will arise. This problem is produced when the sound absorbing material of a publication is used for above-mentioned JP,8-6549,A which has permeability as a head-lining ingredient for automobiles.

[0009] In order to solve such a problem, there are approaches, such as preparing a non-aeration layer between the head-lining ingredient for automobiles which performs non-aeration processing to for example, an epidermis ingredient, and an epidermis ingredient. However, when such non-aeration processing was performed, the noise in the car was reflected in the non-aeration layer, and the head-lining ingredient which consists of a sound absorbing material became a fatal trouble of stopping absorbing sound substantially.

EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, according to this invention, the shaping [which has high reinforcement rigidity, and outstanding sound absorption characteristics] acoustic material which is lightweight and does not have permeability can be offered. Thereby, the shaping acoustic material concerning this invention can be effectively used as the sound absorption material which needs rigidity, for example, the head-lining ingredient for automobiles, an engine room, a dash panel, etc.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] This invention is made in order to cancel the trouble about shaping acoustic material mentioned above, and the main purpose is in offering the shaping [which has high reinforcement, rigidity, and outstanding sound absorption characteristics] acoustic material which is lightweight and does not have permeability. Other purposes of this invention are to propose the approach of manufacturing the above-mentioned shaping acoustic material advantageously.

MEANS

[Means for Solving the Problem] Now, when a sound escapes from the opening of a porous material, friction makes absorption of sound of a porous material which was mentioned above between air and an ingredient, and it is said that it happens by the energy of a sound being transformed into heat energy (for example, refer to "sound absorbing material" Gihodo Shuppan Co., Ltd. written by Koyasu).

[0012] Therefore, if the voidage of an ingredient becomes extremely small, that incidence is hard to be carried out to the interior of an ingredient, it will become and, as for the sound absorption characteristics of a porous material, a sound will fall. It falls, also when a non-aeration layer exists on the surface of a porous material. Moreover, it becomes what was excellent, so that the thickness of an absorption-of-sound layer was so thick that the opening structure of an ingredient was fine when the ingredient of the same voidage compared. So, in order to obtain the ingredient excellent in sound absorption characteristics, voidage is large and it is necessary to consider as the porous material which has detailed opening structure. On the other hand, since the amount of adhesion resin of the fiber for strengthening will decrease relatively if voidage becomes large, the reinforcement of a porous material and rigidity fall inevitably.

[0013] Artificers inquired wholeheartedly towards development of the shaping acoustic material which has high reinforcement, rigidity, and outstanding sound absorption characteristics based on such knowledge. Consequently, it found out that the above-mentioned purpose could be realized by considering as the shaping acoustic material of a three-tiered structure as shown below.

** . It considers as a layer with the high voidage which makes content of the fiber for strengthening relatively higher than the outer layer section for the inner layer section of shaping acoustic material, and has detailed opening structure. Thereby, this layer was made into the structure which raises expansibility and sound absorption characteristics. In a layer with this high voidage, a sound especially with the high frequency of about 2000Hz is absorbed well.

** . By one side of the outer layer section which sandwiches the above-mentioned inner layer section infiltrating resin, and making content of thermoplastics high, rather than the inner layer section, make content of the fiber for strengthening low relatively, and let it be a precise layer with low voidage. Thereby, this layer was made into the structure of preventing reflection of a sound by giving permeability and making a sound absorbing in said inner layer section while making it into the structure which raises rigidity. It is in this precise layer. The sound of a 500-1000Hz

frequency domain is absorbed well.
** . Let another side of the outer layer section which sandwiches the above-mentioned inner layer section be a layer without the permeability which carried out laminating adhesion of the resin film. Thereby, this layer was made into the structure of non-permeability. so, such a shaping acoustic material of a three-tiered structure has reinforcement and high rigidity -- the sound of the large frequency domain which is 500-2000Hz is well absorbable, and it is lightweight and becomes the structure of having non-permeability.
[0014] That is, it is characterized by the shaping acoustic material of this invention having a resin sinking-in layer with the small voidage obtained by infiltrating the following thermoplastics a into one [which has the detailed opening structure which uses thermoplastics and the fiber for strengthening as a principal component] field of a porosity base material, and coming to carry out laminating adhesion of the film of the following thermoplastics b in the field of another side of the base material (refer to drawing 1).
Thermoplastics thermoplastics b with a melt flow rate smaller than the thermoplastics in an account thermoplastics a; porosity base material; thermoplastics with either the melting point or softening temperature higher than sheet-izing of a stumpable sheet, and the material temperature at the time of expansion molding
[0015] Here, in the shaping acoustic material concerning above-mentioned this invention, thermoplastics's being polypropylene and the fiber for strengthening have desirable being [it / glass fiber] **. Moreover, as for Thermoplastics a, it is desirable for the melt flow rate to be 1 / 30 - 1/3 in a porosity base material of a melt flow rate. [of thermoplastics]
[0016] By the manufacture approach of the shaping acoustic material concerning this invention heating the web milled and obtained, and pressurizing the main raw material which consists of thermoplastics and fiber for strengthening, and fabricating, after reheating the stumpable sheet obtained in this way and expanding it In case it sets to the approach of manufacturing shaping sound absorption material, and a web is heated and pressurized and is sheet-ized The laminating of the film of thermoplastics a with a melt flow rate smaller than the thermoplastics in a web is carried out to one field of a web. In the field of another side of a web It is characterized by carrying out the laminating of the film of thermoplastics b with either the melting point or softening temperature higher than whenever [stoving temperature / of the web when sheet-izing].
[0017] Here, using polypropylene as thermoplastics in a web in the manufacture approach of the shaping acoustic material concerning above-mentioned this invention and using-as fiber for strengthening in web-glass fiber ** are desirable. It is desirable to use the resin which is 1 / 30 - 1/3 of a melt flow rate which the melt flow rate contains in a web as thermoplastics a. [of thermoplastics]
[0018]
[Embodiment of the Invention] Below, each component (or element) which constitutes the shaping acoustic material concerning this invention and its manufacture approach is explained.
As thermoplastics used for a web about thermoplastics, the copolymers (for example,

an ethylene-vinyl chloride copolymer, an ethylene-vinylacetate copolymer, etc.) which use resin, such as polyolefines, such as polyethylene and polypropylene, polystyrene, a polyvinyl chloride, polyethylene terephthalate, a polycarbonate, a polyamide, and polyacetal, and these resin as a principal component, a graft compound or the blend article of these resin, etc. is mentioned. Although polypropylene is desirable from reinforcement and a price side especially, there is especially no incongruent thermoplastics about this invention.

[0019] As for this thermoplastics, it is desirable that the melt flow rates of that are 10-300g / 10 minutes. If this reason has a melt flow rate smaller than 10 g / 10 minutes, an adhesive property will worsen, and on the other hand, if larger than 300g / 10 minutes, the reinforcement of resin itself will become low, and in any case, the reinforcement of the acoustic material itself is because it becomes low after all.

[0020] This thermoplastics can use together what was denatured with various compounds, such as an acid and epoxy, in order to raise an adhesive property with the fiber for strengthening. In the case of polypropylene, what denaturalized with the maleic acid, a maleic anhydride, an acrylic acid, etc. is suitable especially, and the denaturation radical has an acid-anhydride radical, a carboxyl group, a desirable hydroxyl group, etc. In addition, an incongruent thing does not have other denaturation radicals about this invention, either. When using such modified resin together with thermoplastics, a web may be manufactured using each resin particle and the pellet which carried out melting kneading of these resin with the extruder etc. beforehand, and the thing which ground this pellet may be used. Moreover, what coated one resin with other resin can also be used.

[0021] In addition, especially the configuration of the above-mentioned thermoplastics used for a web is not limited, but the thermoplastics of the shape of a flake, fibrous [shape / of a particle / others, for example, fibrous,], is used. It is desirable to use especially the thing in within the limits the particle size of whose is 50-2000 micrometers in the case of-like [particle]. When particle size exceeds 2000 micrometers, it is difficult for this reason for the fiber for strengthening to obtain the stumpable sheet which resin distributed to homogeneity, and on the other hand, particle size is because omission of the resin from a web increase in less than 50 micrometers.

[0022] Moreover, the above-mentioned thermoplastics can add the additive for raising weatherability and thermal resistance beforehand. Also in this case, like the case of modified resin, a web may be manufactured using each particle, melting kneading of these particles may be beforehand carried out with an extruder etc., and the ground object may be used. Moreover, what coated one particle with other ingredients can also be used.

[0023] As fiber for strengthening used for a web about the fiber for strengthening, the various organic fiber and the inorganic fiber other than glass fiber, a lock fiber, a carbon fiber, and a metal fiber can be used.

[0024] As for the fiber length of this fiber for strengthening, it is desirable for within the limits of 10-26mm to cost 5-30mm preferably from the point of having rigidity with a sufficient shaping acoustic material obtained, and securing the moldability at the time of paper-milling shaping. This reason is that sufficient rigidity will not be

acquired if fiber length is shorter than 5mm, but that expansion becomes an ununiformity on the other hand while the fiber for strengthening will not fully open at a paper-milling process but the expansibility of a Plastic solid will fall, if fiber length exceeds 30mm, and the formativeness at the time of shaping also gets worse. In addition, it is also effective to mix the fiber of fiber length which is different from the balance of expansibility and reinforcement.

[0025] As for the diameter of fiber of this fiber for strengthening, it is desirable to make 7-25 micrometers into within the limits of 11-23 micrometers preferably from the point of securing the reinforcement effectiveness and the expansion effectiveness by sound absorption characteristics and fiber. This reason is that sufficient expansion scale factor will not be obtained if the diameter of fiber is smaller than 5 micrometers, and sufficient sound absorption characteristics and rigidity will not be acquired on the other hand if the diameter of fiber exceeds 30 micrometers. In addition, if the fiber of a different diameter of fiber is mixed, it is effective when raising the reinforcement effectiveness and the expansion effectiveness by sound absorption characteristics and fiber.

[0026] As for this fiber for strengthening, processing by the coupling agent or the convergence agent is performed as occasion demands. When the fiber for strengthening is glass fiber, in order to improve especially the wettability and the adhesive property with thermoplastics which are a binder component, processing by the silane coupling agent is performed. As this silane coupling agent, it is desirable to use the coupling agent of a vinylsilane system, an amino silane system, an epoxy silane system, an methacrylic silane system, a chlorosilicane system, and a mercapto silane system. Processing of the glass fiber by such silane coupling agent can be performed by known approaches, such as the approach of spraying a silane coupling agent solution, while carrying out stirring mixing of the glass fiber, and an approach immersed in glass fiber into a coupling agent solution.

[0027] Moreover, in order to raise the rigidity of shaping acoustic material, and expansibility, as for the fiber for strengthening, it is desirable to carry out filamentation to a single fiber. Therefore, processing according [the above-mentioned fiber for strengthening] to a water-soluble convergence agent is performed. As this convergence agent, there are a polyethylene oxide system, a polyvinyl alcohol system, etc.

[0028] Although the rate of combination (content) of the fiber for strengthening and the fiber for strengthening occupied in the web after paper milling (after desiccation) about the rate of combination of thermoplastics changes also with addition of the specific gravity of the fiber for strengthening and thermoplastics to be used, or other raw materials When polypropylene is used as thermoplastics, using glass fiber as fiber for strengthening, as for the rate of combination of the fiber for strengthening, it is desirable to make it become 50 - 80wt% to the AUW of a desiccation web. If this reason has few rates of combination of the fiber for strengthening than 50wt(s)%, sufficient rigidity is not expectable, and absorption-of-sound nature is also inadequate, and since expansibility is bad, moreover, porosity mold goods with high voidage will not be obtained. It is because the fall of the rigidity of the shaping acoustic material which it becomes difficult for the thermoplastics as a binder component to be insufficient when

the web after paper milling will become weak on the other hand if the rate of combination of the fiber for strengthening exceeds 80wt(s)%, handling nature worsens and also it is made to expand, and to sink resin into the fiber join for strengthening at homogeneity, and is obtained is caused.

[0029] It is thermoplastics with a melt flow rate smaller than the thermoplastics which contains Thermoplastics a in a porosity base material or a web about Thermoplastics a. In case this thermoplastics a sheet-izes a web, it sinks into one field of a porosity base material, and the amount for strengthening of the surface section of that porosity base material of fiber becomes less than the inner layer section relatively, and it forms a resin sinking-in layer with small voidage. Consequently, the part of this resin sinking-in layer will have the small amount of springbacks, and will not fully expand. For this reason, the surface section of the porosity base material with which Thermoplastics a sank in serves as structure with few openings, and its rigidity improves as the whole shaping acoustic material. On the other hand, since the content of the fiber for strengthening is high compared with a resin sinking-in layer, parts other than the above-mentioned resin sinking-in layer of a porosity base material of the amount of springbacks (inner layer section of shaping acoustic material) are large, and fully expand. For this reason, in parts other than the above-mentioned resin sinking-in layer of a porosity base material, the sound absorption characteristics which carried out expected can be demonstrated. In order to be able to demonstrate the sound absorption characteristics which carried out expected, it is the specific gravity of parts other than said resin sinking-in layer. Carrying out to less than 0.3 is desirable. Thus, the shaping acoustic material obtained by considering as the structure of having a resin sinking-in layer with the small voidage obtained by infiltrating Thermoplastics a into one field of a porosity base material becomes the thing excellent in rigidity, maintaining outstanding sound absorption characteristics.

[0030] An important thing is that one [into which Thermoplastics a was infiltrated] outer layer section of shaping acoustic material surely has permeability here. This is because it is indispensable in order to maintain sound absorption characteristics. In order for the outer layer section concerned to have permeability, the melt flow rate of Thermoplastics a is important, and adopts thermoplastics with a melt flow rate smaller than the thermoplastics contained in a porosity base material or a web as this thermoplastics a in this invention. As for this thermoplastics a, it is desirable more preferably that it is 1 / 30 - 1/3 of MFR which the melt flow rate (only henceforth "MFR") of that resin contains in a porosity base material or a web. [of thermoplastics] If the ratio of said MFR is larger than one third, in case it will sheet-ize, resin sinks even into the inner layer section of a web, and its load carrying capacity of the shaping acoustic material obtained does not improve while it becomes insufficient expanding this reason in the expansion molding performed behind. It is because the noise is reflected in this layer on the other hand as a result of forming the resin layer the layer of Thermoplastics a does not have [layer] aeration in the shaping acoustic material which remains completely on a surface and is obtained in the expansion molding which sinking [of the resin to the inside of a web] in becomes difficult, and is performed behind when the ratio of said MFR is smaller than 1/30, and sound absorption characteristics fall remarkably. Thus, sufficient sound absorption characteristics are obtained only after Thermoplastics a remains in the surface section, without sinking even into the

inner layer section of a porosity base material and is in the condition that aeration occurs.
[0031] The thickness of the film used in case this thermoplastics a is infiltrated is usually 30-300, although it changes with the rigidity and the acoustic absorptivities which are demanded. Being referred to as mum is desirable. For this reason, in less than 30 micrometers, the reinforcement of acoustic material does not fully improve, but, on the other hand, the thickness of this film is 300. It is because expansibility and permeability will worsen if mum is exceeded. Moreover, as this thermoplastics a, the copolymers (for example, an ethylene-vinyl chloride copolymer, an ethylene-vinylacetate copolymer, etc.) which use resin, such as polyolefines, such as polyethylene and polypropylene, polystyrene, a polyvinyl chloride, polyethylene terephthalate, a polycarbonate, a polyamide, and polyacetal, and these resin as a principal component, a graft compound or the blend article of these resin, etc. is mentioned, for example.
[0032] It is thermoplastics with either the melting point or softening temperature higher than whenever [stoving temperature / of the web when sheet-izing Thermoplastics b] about Thermoplastics b. If this thermoplastics b is resin with which are satisfied of the above-mentioned conditions, the copolymers (for example, an ethylene-vinyl chloride copolymer, an ethylene-vinylacetate copolymer, etc.) which are not limited especially, for example, use resin, such as polyolefines, such as polypropylene, polystyrene, a polyvinyl chloride, polyethylene terephthalate, a polycarbonate, a polyamide, and polyacetal, and these resin as a principal component, a graft compound or the blend article of these resin, etc. will be mentioned. The reason for carrying out laminating adhesion the film of such thermoplastics b to the field of another side of a porosity base material or a web here If it is for giving non-permeability to the head-lining ingredient for automobiles and is lower than whenever [stoving temperature / of a web in case either the melting point of Thermoplastics b or softening temperature sheet-izes], maintaining the sound absorption characteristics which were excellent to the noise in the car It is because the melt viscosity of Thermoplastics b becomes low at the time of sheet-izing or expansion molding, a crack tends to go into a film front face and non-permeability cannot be secured.
[0033] The thickness of the film of this thermoplastics b is usually 10-100, although it changes with the rigidity and the permeability which are demanded. It is desirable mum and to be more preferably referred to as 15-60 micrometers. This reason is acoustic material becomes heavy and also economically disadvantageous [acoustic material], if a film tends to be torn at the time of expansion molding and the thickness of this film exceeds 100 micrometer on the other hand in less than 10 micrometers. Moreover, when an adhesive property with the thermoplastics contained in a film and a porosity base material concerned, or a web is not good, on the film concerned, the one or more layer laminating of the adhesive resin (glue line) can be carried out, it can be multilayer-film-ized, and laminating adhesion can be carried out at a web.
[0034] In addition, the above-mentioned shaping acoustic material concerning this invention can be made to contain additives, coloring agents, etc., such as an anti-oxidant, light stabilizer-proof, a metal deactivator, a flame retarder, and carbon black, other than the various components mentioned above. A product can be made to contain these additives and coloring agents by blended and coating beforehand or adding by a spray etc. to the thermoplastics of the shape for example, of a grain, at a web.
[0035] Next, how to manufacture the shaping acoustic material concerning this invention is explained.
(1) Production of a web (the milling-paper method)
foam the water solution containing a surfactant beforehand -- the raw material which uses the

fiber for strengthening and thermoplastics as a principal component is distributed in ******. Subsequently, the solid content in dispersion liquid is made to deposit the obtained dispersion liquid suction and by carrying out degassing on a porous base material, and a nonwoven fabric-like intermediate product is acquired by drying the deposit. The intermediate product of the shape of this nonwoven fabric is called a web. The thickness of this web is usually 1-30mm.

[0036] Here, as a surface active agent which can be used, any of an anion, Nonion, and a cation system are sufficient. It is advantageously used at a point excellent in making homogeneity distribute the raw material with which dodecyl BENZERU sulfonic-acid sodium, coconut oil fatty-acid diethanolamide, etc. especially use the fiber for strengthening, and thermoplastics as a principal component.

[0037] In addition, the web manufactured by the paper-milling approach using a bubble has uniform distribution of the raw material of the cross direction and the thickness direction, and the fiber for strengthening has almost opened it even in the condition of a single fiber.

[0038] (2) The production above of a stumpable sheet (1) A precise sheet (stumpable sheet) is produced by heating, pressurizing the web produced at the paper-milling process so that the fiber for strengthening and thermoplastics may fully sink in, and subsequently carrying out cooling solidification under pressurization.

[0039] The laminating of the film of thermoplastics a with a melt flow rate smaller than the thermoplastics contained [especially] in a web in one field of a web to a sheet chemically-modified [this] degree by this invention is carried out, the laminating of the film of thermoplastics b with either the melting point or softening temperature higher than whenever [stoving temperature / of the web when sheet-izing to the field of another side of a web] is carried out, and the description is that it sheet-izes. The part which Thermoplastics a sank in, the opening became the structure of having permeability few, by this in the outer layer side of the web which carried out the laminating of the film of Thermoplastics a, and the web part except this outer layer side became the structure of having detailed opening structure and that voidage was high, and carried out laminating adhesion of the film of Thermoplastics b can obtain the shaping acoustic material of a three-tiered structure used as structure without permeability.

[0040] Here, as for the preheat temperature of the web when sheet-izing, it is desirable to carry out to more than the melting point of the thermoplastics in a web and under decomposition temperature. the case where thermoplastics is polypropylene especially -- said preheat temperature 170-230 ** -- desirable -- Considering as 190-220 ** is desirable. It is because the coloring and the fall on the strength by the pyrolysis or degradation of polypropylene will be caused if this reason and 230 degree C are exceeded.

[0041] Moreover, the welding pressure of the web when sheet-izing is 0.5 - 50 kgf/cm2, in order to fully infiltrate thermoplastics into the fiber for strengthening. Considering as within the limits is desirable. Welding pressure this reason If smaller than 0.5 kgf/cm2, it will become inadequate sinking in and expected rigidity will not be acquired. On the other hand, welding pressure is 50 kgf/cm2. It is because breakage of the fiber for strengthening will be produced and expected rigidity and expansibility will not be acquired, if it exceeds.

[0042] In addition, all well-known approaches, such as the continuation pressing method using the intermittent pressing method of the usual batch type, Teflon, and a steel band belt as an approach of sheet-izing a web, are applicable.

[0043] Thus, the obtained stumpable sheets are piled up after the fiber for strengthening has opened to the single fiber. For this reason, if melting of the thermoplastics is carried out again,

thickness will be mostly recovered even in the thickness of a web with the rigidity of the fiber for strengthening which is going to return to the condition of the original web. This phenomenon is peculiar to the stumpable sheet produced by the milling-paper method, and is called springback. Since the motive power which causes this springback is the rigidity of the fiber for strengthening, it depends for the magnitude of this springback on the amount and property of the fiber for strengthening.

[0044] (3) Manufacture of a shaping sound absorbing material (expansion molding)

Above (2) The shaping acoustic material concerning this invention is manufactured by carrying out melting of the thermoplastics again, expanding the produced stumpable sheet according to the above-mentioned springback force of the fiber for strengthening, supplying in metal mold, and compressing and carrying out cooling solidification so that it may become smaller than specific gravity in case voidage is zero (this being called expansion molding).

[0045] Here, as for whenever [stoving temperature / at the time of expanding a stumpable sheet], it is desirable to carry out to more than the melting point of thermoplastics and under decomposition temperature. the case where thermoplastics is polypropylene especially -- whenever [said stoving temperature] 170-230 ** -- desirable -- Considering as 190-220 ** is desirable. It is because the coloring and the fall on the strength by disassembly of polypropylene will be caused if this reason and 230 degree C are exceeded. Moreover, the die temperature at the time of pressing the above-mentioned expansion sheet or temperature which carries out cooling solidification is usually made into 60 degrees C or less from the point of handling nature or productivity that what is necessary is just below the congealing point of thermoplastics. Furthermore, an expansion molding pressure is usually 50 kgf/cm2, although it changes with product configurations. It considers as the following. It is because the pressure with this superfluous reason makes the fiber for strengthening fracture.

[0046] In addition, by the manufacture approach of the above-mentioned shaping acoustic material concerning this invention, at the process (making process of a stumpable sheet) which heat and a pressure are put [process] on a web and infiltrates thermoplastics into the fiber for strengthening, the films and sheets other than the film of Thermoplastics a and b, a nonwoven fabric, etc. can be pasted together to coincidence, or compound-ization with other ingredients can be performed, and the function of design nature or others can be given.

EXAMPLE

[Example] Below, this invention is concretely explained based on an example.

(Example 1) The fiber for strengthening and thermoplastics which were used by this example are as follows.

- Thermoplastics : polypropylene particle (MFR;20, mean-particle-diameter; 500micrometer, the melting point; 160 degrees C)
- Fiber for strengthening : glass fiber (die length; 25mm, diameter;13micrometer) (what was processed by the amino silane system coupling agent and the polyethylene oxide system convergence agent)

(1) foam the water solution containing a surfactant beforehand -- into ******, by dry weight %, the raw material of the component presentation which consists of 30% [of polypropylene particles] and glass fiber 70% is mixed, and it becomes total eyes 960 g/m2, respectively -- as -- degassing -- it dried and the web was produced.

(2) Above (1) The polypropylene film (200micrometer thickness, MFR=2) was carried

out as a film of Thermoplastics a, and the laminating of the two-layer film of a nylon 6 film (melting point 233 degrees C, 25-micrometer thickness) and a polypropylene film (melting point 160 degrees C, 40-micrometer thickness, MFR=8) was carried out to the front face of the produced web as a film of Thermoplastics b at the rear face, respectively. At this time, the film of Thermoplastics b carried out and carried out the laminating of the polypropylene film to the web side.
(3) Above (2) The obtained layered product is heated to 210 **, and it is 3 kgf/cm2. The layered product which pressurized by the pressure, and was heated and pressurized is arranged between the 25-degree C cooling boards, and it is 3 kgf/cm2. It pressed and solidified by the pressure and the precise stumpable sheet was produced.
(4) Above (3) The produced stumpable sheet is heated to 210 ** at a far-infrared heater, and it is path clearance. It compressed and cooled with the monotonous metal mold set as 4.2mm, and a good tabular shaping acoustic material was manufactured. Thickness of the shaping acoustic material at this time It was 4.0mm.
[0048] Thus, about the obtained shaping acoustic material, as a result of observing the cross section under a microscope, it turned out that a resin sinking-in layer with low voidage with the low content of the fiber for strengthening exists near a front face as compared with the interior of mold goods. Moreover, although the field into which the laminating of the film of Thermoplastics a was carried out, and it was infiltrated had permeability when the permeability of the obtained shaping acoustic material was investigated, the field which pasted the film of Thermoplastics b together did not have permeability.
[0049] (Example 2) It is thickness like an example 1 except having carried out the laminating of the two-layer film of a polyethylene terephthalate film (melting point 256 degrees C, 25-micrometer thickness) and a polypropylene film (melting point 168 degrees C, 40-micrometer thickness, MFR=8) to the rear face of a web as a film of Thermoplastics b. 4.0mm shaping acoustic material was manufactured.
[0050] Thus, about the obtained shaping acoustic material, as a result of observing the cross section under a microscope, it turned out that a resin sinking-in layer with low voidage with the low content of the fiber for strengthening exists near a front face as compared with the interior of mold goods. Moreover, although the field into which the laminating of the film of Thermoplastics a was carried out, and it was infiltrated had permeability when the permeability of the obtained shaping acoustic material was investigated, the field which pasted the film of Thermoplastics b together did not have permeability.
[0051] (Example 1 of a comparison)
(1) into foam liquid, by dry weight %, the raw material of the component presentation which consists of 30% [of polypropylene particles] and glass fiber 70% is mixed, and it is set to the 1140g of the total eyes/, and m2, respectively -- as -- degassing -- it dried and the web was produced.
(2) Above (1) The laminating only of the nylon 6 film (melting point 233 degrees C, 25-micrometer thickness) was carried out to the rear face of the produced web as a film of Thermoplastics b.
(3) Above (2) The obtained layered product is heated to 210 **, and it is 3 kgf/cm2. The layered product which pressurized by the pressure, and was heated and pressurized is

arranged between the 25-degree C cooling boards, and it is 3 kgf/cm2. It pressed and solidified by the pressure and the precise stumpable sheet was produced.
(4) Above (3) The produced stumpable sheet is heated to 210 ** at a far-infrared heater, and it is path clearance. It compressed and cooled with the monotonous metal mold set as 4.2mm, and a tabular shaping acoustic material whose thickness is 4.0mm was manufactured.
[0052] Thus, although it was a layer without an opening, as for the field which carried out the laminating of the film of Thermoplastics b as a result of observing the cross section under a microscope about the obtained shaping acoustic material, it turned out that other parts have the structure of having a uniform opening. Moreover, although the field which did not carry out the laminating of the film had permeability when the permeability of the obtained shaping acoustic material was investigated, the field which carried out the laminating of the film of Thermoplastics b did not have permeability.
[0053] (Example 2 of a comparison) It is thickness like the example 1 of a comparison except having produced the stumpable sheet, without carrying out the laminating of the film to both sides of a web. 4.0mm shaping acoustic material was manufactured.
[0054] Thus, about the obtained shaping acoustic material, as a result of observing the cross section under a microscope, it turned out that it has the structure of having a uniform opening. Moreover, when the permeability of the obtained shaping acoustic material was investigated, both sides had permeability.
[0055] The shaping acoustic material of examples 1 and 2 and the examples 1 and 2 of a comparison to 50mm width-of-face x120mm manufactured as explained above The test piece of die length was cut down and the bending test (crosshead speed 50 mm/min, distance between spans of 100mm) which pushes punch from the field (field which is not pasting the film together about the example of a comparison) which pasted the film of Thermoplastics a together about this test piece was performed. The elastic inclination at this time is the distance between spans. Load at the time of 100mm (kgf) It bends and is the inclination of an amount (mm). Moreover, the normal incidence sound absorption coefficient according to JIS A 1405 was measured. A normal incidence sound absorption coefficient is 1.0. Solving, a sound absorbs sound completely. Consequently, the result of the acoustic-absorptivity measurement of the result of a bending property to Table 1 is shown in drawing 2 .
[0056]
[Table 1]

	最大荷重（kgf/50mm）	弾性勾配（kgf/cm/50mm）
実施例1	5．31	8．33
実施例2	5．29	8．43
比較例1	1．88	4．43
比較例2	1．86	4．32

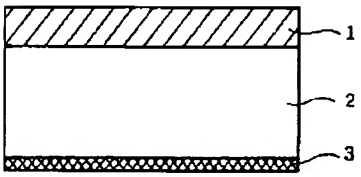
[0057] When making it structure like this invention so that clearly from the result shown in this Table 1 and drawing 2 , it turned out that shaping acoustic material becomes the thing excellent in the sound absorption characteristics in a 500-2000Hz large frequency domain while maximum load and elastic inclination become high and it shows the outstanding strength property.

DESCRIPTION OF DRAWINGS

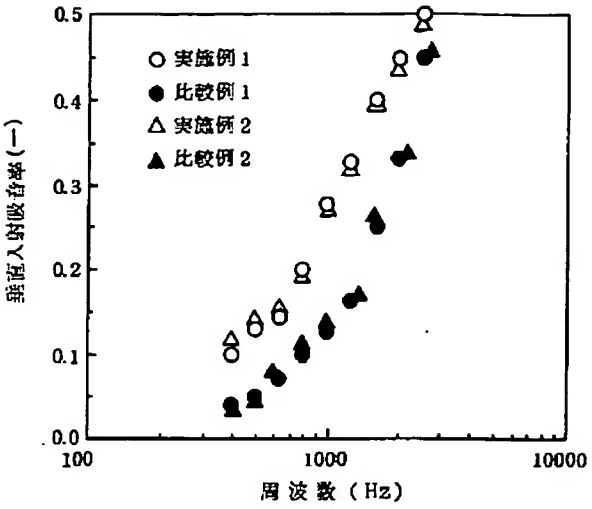
[Brief Description of the Drawings]
[Drawing 1] It is the partial cross-section schematic diagram showing the structure of the shaping acoustic material concerning this invention.
[Drawing 2] It is drawing showing the relation between a normal incidence sound absorption coefficient and a frequency.
[Description of Notations]
1 Resin Sinking-in Layer Which Comes to Sink into Porosity Base Material in Thermoplastics A
2 Layer of Porosity Base Material Which Uses Thermoplastics and Fiber for Strengthening as Principal Component
3 Layer of Thermoplastics B

DRAWINGS

[Drawing 1]



[Drawing 2]


0.5
0.4
0.3
0.2
0.1
0.0
垂直入射吸音率(—)
○ 実施例1
● 比較例1
△ 実施例2
▲ 比較例2
100
1000
10000
周波数（Hz）